ELECTRICAL REVIEW

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EDITORIALS

ALTERING CONTRACT RATES.

The right of state legislatures, or by delegation of power, of state utility commissions, to alter rates for utility service fixed by private contract, when such rates are found to be unreasonable or discriminatory, is generally recognized and has been confirmed by many court decisions. A recent case in West Virginia, although giving support to this principle, presents an example of the care with which a utility corporation must proceed if it is to have legal support to its rights in such cases.

The Randall Gas Company secured permission from the Public Service Commission to increase its rates, but the Commission did not issue any order putting the rates into effect, nor did the company, after securing permission for rates not exceeding a certain maximum, file a new schedule with the Commission nor publish it for the information of the public. The law requires three days' notice to the Commission and the public of any change in rates, with a plain statement of the changes proposed and the time at which they would become effective.

The dispute between the Gas Company and a customer having a ten-year contract with it was taken into court and finally appealed to the Supreme Court of Appeals of West Virginia. In its decision that tribunal recognizes the legality of rates prescribed or authorized by the Public Service Commission as supplanting rates established by private contract, but this particular case was decided against the Gas Company on account of improper procedure in putting the rates into effect, and the utility will consequently be unable to collect the new rates from this particular customer until such rates are properly filed and advertised. This is in spite of the fact that there was no opposition to the proposed increase when the matter first came before the Public Service Commission, such application having been duly advertised.

The very closest study of the letter of the law is advisable in every case where a utility undertakes to raise its rates. When rates are lowered voluntarily by a utility corporation, there is usually no one to object, and fine points of procedure are not likely to be brought in question before a legal tribunal; but where action is taken adversely affecting a large number of persons, there is likely to be some one who will detect and take advantage of the slightest irregularity of procedure and by technicalities try to defeat or at least hamper putting the higher rates into effect.

THE FUNCTION OF THE ENGINEER IN UTILITY VALUATIONS.

One result of the widespread regulation of public utilities by government commissions has been the necessity for many valuations of utility properties. In rate determinations increasing prominence has been given to the elements of value of the property used in the service and the rate of return allowed upon the same. Obviously, rates must be high enough to cover operating expenses, including depreciation, and to provide the specified return upon the specified value. Decisions of the Supreme Court of the United States have emphasized the necessity of determining the value of utility property at the present time, and while that value is not necessarily fixed by either original cost, reproduction cost, or any other single operation of valuation, appraisals of the property are generally required and engineers are usually called upon to make such appraisals.

The work of the engineer is primarily with the materials of the earth and with the transformations of energy brought about through the use of these materials. His work deals primarily with matters of fact and with the behavior of matter and of energy. He is a most suitable person to make an inventory of any engineering structure or system and also to determine what is an average or proper unit cost for its construction or preparation for operation. The real work of the engineer ceases at this point in connection with an appraisal. The value of a structure, a machine or a system in the commercial sense can hardly be classed as an engineering fact, and the engineer as such is no more competent to determine such value than the man in the street. Intangible values, which make up such a large element in the valuation of many utility properties, are largely matters of opinion, and in giving such opinions the engineer is no better qualified to act than is the financier, the lawyer or the executive. Indeed, in many cases he is not nearly so well qualified. Moreover, such opinions are not matters of engineering and engineers differ as much in their determinations of them as any other class of people might do. When such opinions are attached to engineering appraisals they cause numerous discrepancies in the valuations by different engineers, and thus have a tendency to destroy the repute and confidence of engineers in the eyes of the rest of the community.

When engineers confine themselves to inventories of physical property they have little trouble in reaching agreement, and even when unit prices are attached to

such inventories in order to make utility appraisals of physical property there need not be great disagreements. Refusal upon the part of the engineer to go further than this would be entirely appropriate and proper. If engineers were to confine their efforts to physical appraisals and leave the discussion of intangibles to others, the position of the engineer would be greatly improved and the results of his work would meet with more ready acceptance upon the part of all. Indeed, in matters of fact, such as those with which the engineer properly deals, it would be advisable if the engineers, instead of being retained by the different parties to the matter at issue, were to be selected, without bias toward either side as independent experts, and were to have a relation to the issue only as such and not as advocates for either party.

VALUES IN OPPOSITE CHARACTERISTICS.

It is a well known aphorism that it takes all kinds of people to make up a world. Of the various kinds with which we are all familiar there are two who are intimately related to the electrical industry that present a marked contrast. The two we refer to are the inventor and the salesman.

The types of men who seem naturally equipped to carry out the functions represented by two such individuals are in some ways diametrical opposites. The inventor deals with the materials and the forces of nature. He must learn their properties and devise ways of applying them to accomplish some purposes for which there is a human demand. He is concerned mainly with physical and chemical facts. The salesman, on the other hand, is concerned with people and their psychology. He must recognize their different types and must know how to appeal to the idiosyncrasies of each one in order to make a favorable impression for himself and for the goods which he represents. He must be a good talker. He must be courteous and pleasing in appearance if he is to have the greatest success.

In his attitude towards the materials or properties which he handles the inventor and the salesman again must and naturally do take exactly opposite points of view. The salesman must believe in the product which he sells, he must think that it is all right and be enthusiastic in putting forward its claims and in describing its virtues. The inventor, on the other hand, must be alive to every defect, he must see the shortcomings of his product and devise ways and means for improving it, for finding something else which will attain the desired object in a better, more efficient or cheaper way. His mind naturally dwells on the imperfections of the product, while the mind of the salesman must dwell upon its good qualities. We might properly classify them by saying the salesman must be an optimist and the inventor must be a pessimist. The latter distinction is not to be taken too literally however, as the inventor must have faith in the existence of better means of accomplishing his purpose and in his own ability to find them.

The average salesman, if successful in his work, will probably never succeed in the role of an inventor. On the other hand, one can paint a humorous picture of the inventor approaching a prospective customer with his mind dwelling upon the weak points of his product and describing in glowing terms what defects there are to be overcome and what are the possible methods of attacking the problem of improving these defects. The impression that he would make is not one that would be likely to end with a sale.

UTILIZING OUR PEAT.

In spite of all the public discussion which we have had in this country during the past eight years on the subject of conservation and the utilization of the natural resources of the country, but little attention has been given to the utilization of our vast resources of peat. Numerous supplies of this substance exist in certain parts of the country and notably where coal is absent, as in the states of Wisconsin and Minnesota.

The use that can be made of this material can best be illustrated by what has been done abroad. The German Government spent large sums of money in investigating the use of peat from the extensive moors in the neighborhood of Bremen, an experimental station being first utilized to investigate the possibilities there and in other parts of the country. It was found possible to use the peat in generating power through the medium of gas producers and gas engines. A number of cities and a large rural district are now supplied by power from this source.

The utilization of the peat, however, does not stop at the production of power. The residue in the gas producer contains considerable quantities of sulphate of ammonia and tar. The latter can be used as a fuel in operating the gas producer, while the former has a great value as a fertilizer and constitutes an important source of nitrogen supply. About 75 per cent of the total nitrogen is recovered.

Italy and Russia are making similar use of the extensive peat bogs. Utilization of nitrogen is important in times of peace for fertilizer, but in times of war it is even more important that a supply be available for the manufacture of explosives. Germany, realizing this, has invested since the outbreak of the war about $100,000,000, it is estimated, in plants for the electrical fixation of nitrogen and this supply takes the place of the 800,000 to 900,000 tons of nitrates which were formerly imported annually.

There has been considerable agitation in this country for the establishment of hydroelectric plants upon suitable sites for the fixation of nitrogen, and with these proposals we are in hearty accord. The fact should not be overlooked, however, that vast supplies of nitrogen are available in the utilization of peat and the recovery of the nitrogen in coal by the use of by-product coke ovens in place of the notoriously wasteful bee-hive ovens. Utilization of the two latter sources could no doubt be made to supply the entire demand for nitrates in this country at the present time and entirely obviate

the need for imports of such substances. One ton of peat will produce 750 kilowatt-hours of energy, 125 pounds of sulphate of ammonia and 35 gallons of tar. The two latter products are worth at market prices enough to cover the entire cost of operation, leaving the energy developed as a clear profit from the operation. Consequently the construction of power houses using this source of fuel in any localities where there is a demand for power should prove a commercial success.

THE VALUE OF AUTOMATIC RECORDING DEVICES.

The troubles of electrical origin which occur upon electrical circuits may be classified as those due to high voltage, high currents and high frequencies, the latter being usually associated also with high voltages. Conditions of these abnormal kinds may arise in a variety of ways, such as from lightning, short-circuits, arching grounds and switching. The abnormal condition may result in a breakdown at some point of the system or in the operation of some device, such as a lightning arrester, whose function is to prevent trouble by its operation. In many cases when such devices operate or when damage is done the cause is obvious, but in other cases the operator's knowledge is not sufficient to account for the phenomenon and a search for the underlying cause leads him into a realm of conjecture or mystery.

That there are two other sources of trouble upon electrical systems which operators must take into consideration was well brought out by Dr. C. P. Steinmetz when discussing one of the papers recently presented at the convention of the American Institute of Electrical Engineers. These two factors, which are sometimes overlooked, are carelessness and dirt. The presence of dirt may lead to arcing over at voltages less than were intended by the designer of the apparatus, and when such discharges take place the assumption made as to the voltages which must have existed on the line may be greatly in error. Carelessness of attendants similarly may produce conditions, as by the throwing of a switch, for which there seems to be no adequate explanation, as the act in question is one which will probably not appear upon the station log.

In order to have an accurate exhibit of the exact conditions which appear upon the system at any time, it is desirable to make use to as large an extent as possible of automatic recording devices. A sufficient variety of such instruments exist so that by their use a permanent record may be had not only of every disturbance upon the system, but of the conditions which preceded and led up to that disturbance. Records of this kind would probably explain many events which have been regarded as mysteries.

A single example of such a device will be sufficient to illustrate their value and effectiveness. A number of power stations are now supplied with a device for recording the conditions of two generators with respect to synchronism at the instant when they are thrown into parallel. Such a record is of value not only to the engineer in charge in showing him the conditions that existed at the instant of throwing the switch, but they are of value to the operator in training himself to perform such an operation well. By knowing how nearly the two machines were in synchronism when he threw the switch, in a particular instance, he is enabled to learn how to conduct the operation in future instances so that the switching is timed for accurate synchronism.

UTILIZING TEMPERATURE INDICATORS.

The rating of most specimens of electrical machinery and apparatus is determined by the amount of heat developed in them and the facility with which they can dissipate it. In other words, limitations of temperature usually determine the rated capacity, since the heat generated increases with the load. This statement is not universal, since requirements of torque or of successful commutation may sometimes set a lower limit to the rating, but such cases are exceptional.

To determine the rating of a machine, the temperature while in operation must be measured, and not merely the surface temperature, but that of the hot spots also must be known. This requirement has led to the use of thermo-elements and resistance thermometers, which are embedded alongside the conductors of the machine during manufacture, and the terminals brought out so as to be accessible during operation. Opinions differ as to which of these two types of temperature indicator is the more satisfactory, but no doubt either can be made reliable and convenient, if properly handled.

The dissipation of heat, especially in rotating machinery depends largely upon the ventilation, and ventilating ducts are consequently provided in the structure of the machine. An adequate supply of cooling air depends upon keeping these ducts open, but the general tendency is for them to become clogged with dust and dirt, so that the initial supply of ventilating air diminishes with time and use. This means that the machine cannot be loaded to its original rating without becoming overheated, with the possibility of damage to insulation and ultimate burn out.

It is here that the regular use of the temperature-indicating devices can be made of value, and especially when recording instruments are used. The gradual clogging of ducts is readily made apparent, and the time for the regular cleaning of the machine can be so chosen as to obviate overheating and at the same time avoid any embarrassment which might arise from a sudden necessity for cutting a machine out of service. A number of large power stations have such temperature indicators in regular service on their generators and the greatest measure of usefulness from each generating unit can thus be attained.

Happenings in the Industry

Association of Edison Illuminating Companies Announces Convention Plans—Increased Water-Power Developments at Niagara Falls and Joliet—Plans for Chicago Electric Club-Jovian League Picnic—Committee on Electric Wiring Systems—Mountain Electrification Successful—Miscellaneous News Notes

Convention of the Association of Edison Illuminating Companies.

As previously announced, the 1916 convention of the Association of Edison Illuminating Companies will be held at "The Homestead," Hot Springs, Va., September 4-7. Arrangements for this occasion are nearly completed and the outlook for a successful meeting is very promising.

The business program, following the custom established last year, will be arranged to group similar subjects at different sessions, thus allowing ample time for both presentation and discussion.

Following the presentation of reports of the steam and electric plant committees, one session will be largely devoted to general discussion of technical problems. It will conclude with a demonstration of original ideas on "Better Lighting; Its Possibilities for Customer and Central Station," by W. A. Durgin, of Chicago, Ill.

The printed report of the lamp committee, containing late information pertaining to lamp matters, will be presented by Chairman John W. Lieb, of New York City, and with a paper by Peter Junkersfeld, of Chicago, Ill., on "The Control of Incandescent Lamps," will be open for discussion. The subject of street lighting and the committee's report will also be considered at this session.

The report of the residential service rate committee; to be presented by Chairman Alex Dow, of Detroit, Mich., will open the session on rates and sales. This report will be followed by a paper on "Extensive Methods of Meeting Private Plant Competition," to be presented by R. S. Hale, of Boston, Mass. The remainder of the session will be devoted to a general discussion of features of central-station rate-making.

An attractive entertainment program is being arranged and several new features have been included. The entire schedule has been planned so as not to conflict with the business sessions.

C. L. Law, of the New York Edison Company, has been appointed master of transportation and will issue a general circular giving full details on transportation matters. Requests for hotel accommodations should be made to E. A. Baily, assistant secretary, 360 Pearl Street, Brooklyn, N. Y.

California Electric Corporation Makes Application for Sale.

Application for the sale of the Oro Electric Corporation, San Francisco and Oroville, Cal., and subsidiary corporations, distributing electrical energy in Butte, Yuba, Amador, Calaveras and San Joaquin Counties, to the Pacific Gas & Electric Company for $1,491,451.35 has been taken under advisement by the Railroad Commission. The merger, one of the most important in the public utility history of the state, has been long forecasted. The agreement of sale was entered into last January. The subsidiary concerns are Oro Water, Light & Power Company, the Oroville Light & Power Company and the Oroville Light Company. The Oro interests give as their reason for selling that they are without sufficient funds to develop the properties properly and to complete the hydroelectric projects on Yellow Creek and Mill Creek, the estimated cost of which when completed is $8,000,000.

Plans for Further Water-Power Development at Niagara Falls.

Interest is being revived in the proposed plan of constructing a dam below the rapids in the Niagara River Gorge by means of which it is expected that 1,000,000 horsepower can be developed without at all affecting the flow of water over the falls proper. The matter is being agitated and some efforts have been made to secure the opinion of both the United States and Canadian authorities regarding the scheme. This additional power it is said can be developed at comparatively small cost. It is proposed to apportion it between Canada and the United States in the same ratio now provided for.

The Ontario Hydro-Electric Power Commission has practically completed plans for securing an additional 32,000 horsepower to supply the increasing power demands of the various municipalities in the Province of Ontario. This power will be supplied by the Canadian Niagara Power Company, which up to the present time has been transmitting most of its power to New York State. The price proposed will be considerably in advance of the $9 per horsepower now paid to the Ontario Power Company. The 100,000-horsepower limit which the Commission can secure from the latter company has practically been reached, necessitating further contracts for the additional power. It is expected that before the end of 1917 the Commission will be taking 175,000 horsepower from Niagara Falls.

Increased Water-Power Development Proposed at Joliet, Ill.

The lease of the water power at the Jackson Street dam, Joliet, Ill., which has been held by the Economy Light & Power Company, a subsidiary of the Public Service Company of Northern Illinois, is about to expire and the Commissioners of the Illinois & Michigan Canal have sought bids for re-leasing this power. On July 17 two bids were received, one by Andrew Cooke, of Chicago, who bid $3 a horsepower per year. The other bid submitted was by the Sanitary District of Chicago, which bid for the power at $15 a horsepower a year. In all likelihood this latter bid will be accepted. It applies to a maximum of 7,000 theoretical horsepower and any excess above this will be paid for at $1 per horsepower. This bid involves taking over and completely rebuilding the water-power plant, but no work on the dam. At present the water-power plant contains some 33 wheels and developes only about 3,000 horsepower. It is believed that by putting in modern and efficient equipment 7,000 horsepower can be easily developed. The average head at this point is about 12 feet. If the bid of the Sanitary District is accepted on this condition, better control of the channel between the dam at Joliet and the tail-race of the Sanitary District power house about two miles above this point will be obtained so that from one to one and one-half feet additional head will be available at the latter plant. An alternative bid was also submitted by the Sanitary District under which it proposed to install a lock at its present Lockport hydroelectric power plant and to deepen the channel between this point and Joliet so as to conform to the deep waterway project which the State Legislature has authorized.

Elaborate Plans for Outing of Chicago Electric Club-Jovian League.

The annual outing and picnic of the Electric Club-Jovian League will be held this summer at Ravinia Park, Ill., on August 10 and every effort is being made to exceed all former records. The outing will be an all-day affair and will be not only for the members, but for their families and friends. Special trains on the Chicago & Northwestern Railway will be provided both going and coming and the band of the Chicago Telephone Company will furnish special music for the occasion. As usual there will be a very large number of races, athletic and other contests for which an exceptionally large number of prizes are being donated by electrical interests of Chicago. These prizes in all likelihood will be more numerous and of still more valuable character than ever before. A Jovian grand prize automobile will be displayed and the winner's name announced. A number of new features in the entertainment line will be introduced.

Special arrangements are being made this year to have the outing participated in by allied electrical organizations of Chicago, among them including the Chicago Electrical Contractors' Association, Chicago Electrical Credit Association, Chicago Section of the Electrical Supply Jobbers' Association, Electric Vehicle Section of the National Electric Light Association, Chicago Section of the Illuminating Engineering Society and other organizations.

The chairman of the General Picnic Committee is W. R. Pinckard, Westinghouse Electric & Manufacturing Company. Chairmen of the more important subcommittees are as follows: H. A. Mott, grounds and transportation; Fred M. Rosseland, program; Guy W. Lunn, games; J. D. A. Cross, prizes; Perry Boole, co-operation; A. R. Bone, music; W. R. Bonham, decorations; H. G. Hafner, tickets; J. N. Pierce, automobiles; W. E. Bischoff, police; C. W. Forbrich, finance; R. I. Phillips, refreshments; A. B. Hatch, dancing; Victor H. Tousley, reception.

Electric Signal System Recommended for Nashville Police Department.

A recommendation that the police department of the city of Nashville, Tenn., install an electric signal system is contained in a report on this department made to the commissioners by James Cameron and staff, of New York, auditors who are making an efficiency survey of the municipality. The Gamewell system is advised by the investigators but it is stated that if this cannot be installed at the present time, a flashlight system should be established. It is suggested that this could be done by the lighting department of the city with practically no additional cost for labor, the entire expense being probably less than $2,000. At the present time, it is not uncommon for a patrolman to be compelled to walk a mile or more at night to reach a telephone. A signal connection with local pawnbrokers is also advised. The investigators reiterate the recommendations of the National Board of Underwriters concerning the signal system of the fire department.

Wisconsin Contractors to Hold Summer Convention.

The summer meeting of the Electrical Contractors' Association of Wisconsin, which has become an annual event of the organization, will be held August 9 to 12, inclusive, at the Grand View Hotel, Chain O'Lakes, Waupaca, Wis. The party will assemble on August 9 for business sessions and on the morning of August 10 will leave for Gills Landing where a boat has been chartered for a cruise to New London. The return will be made to Oshkosh where the convention will adjourn.

Albert Petermann, 626 Lloyd Street, Milwaukee, Wis., is secretary of the Association.

Civil-Service Examinations for Electrical Postions.

The United States Civil Service Commission announces an examination on August 15, for electrical draftsmen to fill several vacancies in this position in the New York Navy Yard at salaries ranging from $3.52 to $6 per diem, and vacancies as they may occur in positions requiring similar qualifications, at any navy yard or in the Navy Department at Washington. As the supply of eligibles resulting from recent examinations for draftsmen with marine electrical experience has not been equal to the demand, qualified persons are urged to enter this examination. Competitors will not be assembled for examination, but will be rated on education and preliminary or apprenticeship training, and experience. Applicants must be at least 18 years old, and must have had the equivalent of a high school education and four years' practical experience, of which two years have been employment in marine electrical drafting, or a degree in engineering from a technical school of recognized standing and one year additional practical experience in marine electrical drafting. It is important that the drafting experience required be of a marine electrical character such as may be acquired in the electrical department of a ship-building company at whose plant battleships, torpedo boat destroyers, or submarines are built, or in some United States naval establishment. Statements as to education, training, and experience are accepted subject to verification. Persons who meet the requirements and desire this examination should at once apply for Form 1312, stating the title of the examination for which the form is desired, to the United States Civil Service Commission, Washington, D. C.

The Civil Service Commission announces an open competitive examination for laboratory assistant, for men only, to fill vacancies in the Bureau of Standards, at salaries ranging from $900 to $1,200 a year, on August 23-24, 1916, at the usual places. This examination is also scheduled to be held on October 11-12. In addition to the basis subjects of the examination the following optional subjects will be given, in at least one of which the competitor must attain a rating of 70: advanced general physics, civil and mechanical engineering, electrical engineering, paper technology, textile technology. Applicants must have reached their twentieth but not their thirty-fifth birthday on the date of the examination. Persons desiring to enter this examination should at once apply for a copy of the Manual of Examinations and Form 1312, to the United States Civil Service Commission, Washington, D. C.

New England Section, N. E. L. A. Convention.

Plans have been changed for the annual convention of the New England Section, National Electric Light Association, which will be held October 17-20, at Hotel Maplewood, Pittsfield, Mass. The place, in the heart of the Berkshire region, will be especially attractive at that season. The technical program will include many important and interesting subjects. Miss O. A. Bursiel, 149 Tremont Street, Boston, Mass., is secretary of the Section.

Electric Coal Delivery in New England.

New England has so far been the most progressive in adopting the electric truck for the delivery of coal, in fact, nearly all of the coal companies in and around Boston use the electric for the short haul. One large coal company which operates a fleet of eight electric trucks of 6-ton capacity, has recently issued orders not to buy any more horses. This company claims that within the half-mile radius they can operate the electric truck more economically than horses, which they formerly used for hauls of this length. Within a 2.5-mile radius they find that the electric

is cheaper than gasoline. To cite an instance of the remarkable efficiency with which these trucks operate, one of their 6-ton electrics delivered 84 tons of coal in 9 hours at a total cost of $15 or less than 20 cents a ton delivered, including all possible expenses. It made 14 trips, with a total of 34 miles for the day, showing a radius of a little over a mile. They figured that the electric truck did the same amount of work in one hour that was formerly done by two two-horse teams with four men in 3.5 hours.

The Staples Coal Company, of Boston, finds that night delivery is a big factor in handling its coal trade efficiently, and practically all the coal which it supplies to the office buildings, warehouses, department stores, etc., in the business districts, is delivered at night. Coal trucks which must back up to the curb in delivering coal in business districts greatly impede traffic especially in narrow streets and are a cause of much delay and annoyance to truck drivers. Night delivery avoids all this and the Staples Coal Company finds that it can operate its electric trucks 18 hours a day with two shifts of drivers. The average delivery for an 18-hour day is 140 tons of coal, covering a total distance of about 56 miles at an approximate cost of $21. Improvement in batteries and their increased mileage capacity allows the electric to work without interruption. The Staples trucks average 34 miles on one battery charge, and under their methods of operating two sets of batteries, one is kept on charge during the day for use of the night shift, while the used batteries are recharged at night. In order that this company may get the maximum amount of work out of its equipment, it is kept in active service continually and at the noon hour there is an exchange of drivers so that the trucks need not have a moment's idleness. In addition to accomplishing the 34 miles on a single battery charge, the batteries supply current for hoisting and lowering the dumping bodies which consumes a considerable amount of electricity and it takes from three to four minutes to raise a dumping body by electricity and the same length of time and energy to lower it.

As more and larger office buildings are erected every year, street congestion becomes greater and traffic conditions become more of a problem; so that the delivery of coal, which of necessity blocks traffic to a certain extent, will have to be done at night in districts where conditions demand it. Experience has proved that the electric truck is best adapted for such a service. With sufficient exchange of batteries the electric is capable of almost unlimited mileage, and the transfer of batteries from the charging plugs to the vehicle is a matter of only a few minutes, taking actually less time than to fill a gasoline tank with oil. The noiselessness of the electric vehicle is another feature which especially recommends it for night service. While the actually dumping of coal is necessarily a more or less noisy process, the business houses to which coal is delivered at night are remote from the residential districts. However, it is often necessary for the trucks which deliver the coal to pass through streets in which there are dwellings, and a heavy 5 or 6-ton gasoline truck with its crunching of gears and its nosy explosive exhausts would not be practical to use there at night.

In addition to these features the electric vehicle is efficient and by far the most economical. Some manufacturers give an almost absolute guarantee of the cost of operating an electric truck over a certain number of years. The user knows before hand what his battery maintenance costs will be. He can estimate almost exactly what his current will cost, tire expense and repairs. He knows what his garage rates will be. In fact, the only item of expense which cannot be definitely determined is what he will pay his driver. From the experience of others he can judge the performance of the electric truck and is able to tell how he can best adapt it to his own individual needs.

Committee on Electric Wiring Systems of the Electrical Industry.

Referring to page 1104 of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, of June 17, 1916, there appears an article entitled "Concentric and Other Bare Grounded-Return Wiring Systems to be Investigated." In the first paragraph of this article it is stated that shortly after the organization of the Associated Manufacturers of Electrical Supplies, there was appointed by it a Committee of Business and Technical Experts on Concentric Wiring, which later became known as the Committee on Electrical Wiring Systems in the Electrical Industry. This is an incorrect statement and has been called to our attention by William S. Boyd, secretary of the Subcommittee on Bare Grounded-Return Wiring Systems.

The facts are that a Committee of Business and Technical Experts was appointed by the Electrical Industry, and this included the representatives of a number of electrical associations not connected in any way with the manufacture of electrical supplies. A list of these associations, together with their representatives is included in the following:

Committee on Electric Wiring Systems.
(Formerly Committee of Business and Technical Experts.)

Le Roy Clark, chairman, The Safety Insulated Wire & Cable Company, New York, N. Y.

J. H. Trumbull, secretary, Trumbull Electric Manufacturing Company, Plainville, Conn.

W. T. Pringle, treasurer, Pringle Electric Manufacturing Company, Philadelphia, Pa.

W. H. Blood, Jr., National Electric Light Association, Boston, Mass.

William S. Boyd, Western Association of Electrical Inspectors, Chicago, Ill.

W. C. Bryant, Bryant Electric Company, Bridgeport, Conn.

F. V. Burton, Bryant Electric Company, Bridgeport, Conn.

C. E. Corrigan, National Metal Molding Company, Pittsburgh, Pa.

H. B. Crouse, Crouse-Hinds Company, Syracuse, N. Y.

L. W. Downs, D. & W. Fuse Company, Providence, R. I.

Gano Dunn, J. G. White Engineering Corporation, New York, N. Y.

W. H. Flandreau, International Association of Municipal Electricians, Mt. Vernon, N. Y.

J. C. Forsyth, American Institute of Electrical Engineers, New York, N. Y.

E. B. Hatch, Johns-Pratt Company, Hartford, Conn.

D. C. Jackson, Massachusetts Institute of Technology, Boston, Mass.

G. S. Lawler, Associated Factory Mutual Fire Insurance Companies, Boston, Mass.

Dana Pierce, Underwriters' Laboratories, Incorporated, New York, N. Y.

H. R. Sargent, General Electric Company, Schenectady, N. Y.

George A. Sawin, American Institute of Electrical Engineers, Newark, N. J.

R. K. Sheppard, Simplex Wire & Cable Company, Boston, Mass.

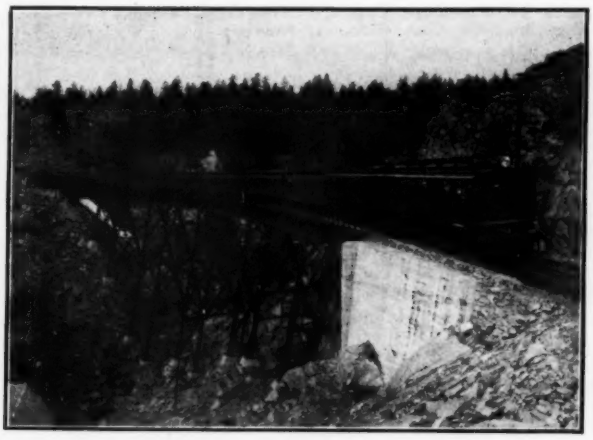
C. E. Skinner, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Gilbert S. Smith, Electrical Supply Jobbers' Association, Philadelphia, Pa.

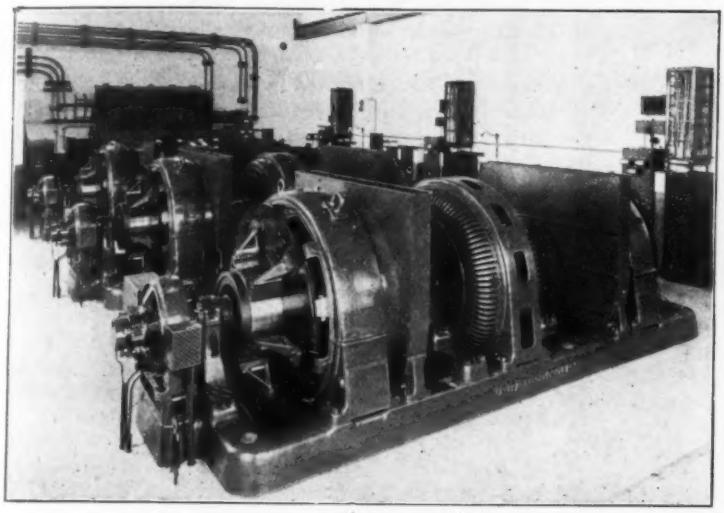
S. W. Stratton, Bureau of Standards, Washington, D. C.

J. R. Strong, National Electrical Contractors' Association, New York, N. Y.

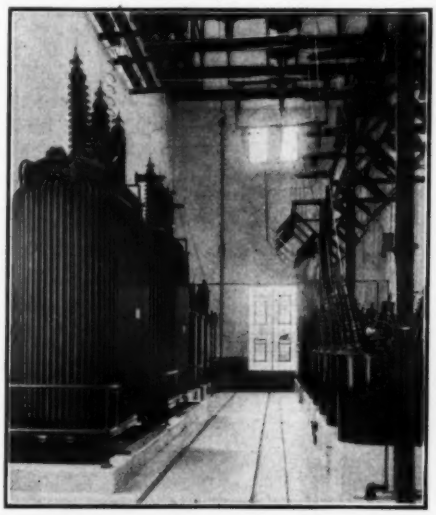
Mountain Electrification Proves Complete Success



Chicago, Milwaukee & St. Paul Electrified Freight and Passenger Trains, Descending Two-Per-Cent Grade on Eastern Slope of Rocky Mountains. Double-Unit, 3,000-Volt, Direct-Current Locomotives Used.



Piedmont Substation With Three 1,500-Kilowatt Synchronous Motor-Generator Sets Furnishing Direct Current at 3,000 Volts.



Morel Substation. 100,000-Volt, Three-Phase Transformers and Oil Switches.

Great Falls Dam and Power House at Volta. One of the Chief Sources of Power Supply.

Interior of Volta Power House, Showing Four 8,000-Kilowatt Vertical Generators.

Entire success with important economies has marked the partially completed electrification of the Rocky Mountain divisions of the Chicago, Milwaukee & St. Paul Railway. The general scope and many of the details of this epochal electrification have already been described and illustrated in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of December 26, 1914, and October 23, 1915. The first electric locomotives were placed in regular service last December on the 115-mile division crossing the Continental Divide, where they were given their initial tryout under the severest service conditions. Last April electric service was extended to Harlowtown, making 220 miles of electrified road. By November 1, 1916, it is expected that steam engines will be superseded over the entire stretch of 440 miles from Harlowtown, Mont., to Avery, Idaho. Among the advantages of electrified service have been found the following: Reduction in running time, haulage of heavier trains, regenerative braking with reduced wear and tear, freedom from trains being stalled in winter, absolute cleanliness, and popularity with the travelers.

Miscellaneous NEWS NOTES

Tokyo Street Car Fares.—The fare on the municipal street cars in Tokyo, Japan, has been increased from four to five sen, or from 2 to 2.5 cents, in spite of intense public opposition.

Utility Sues for Alleged Excess Assessment.—The Arkansas Valley Railroad, Light & Power Company, a Colorado concern, has filed suit in the District Court at Pueblo, Colo., against the city for the recovery of $29,925.13. This sum the company claims is the excess of the legal assessment for improvements in the Mineral Place paving district.

Denver Company to Aid Employees Entering War.—The Denver Gas & Electric Light Company has made known its intention of keeping on its pay roll all their employees that go to Mexico with the Colorado National Guard. The company has also contributed $1,000 to a fund being raised by one of the local newspapers for the care of needy families here that have been occasioned as the result of the calling out of the militia.

Activities of Nashville Jovians.—A rejuvenation was held by the Nashville (Tenn.) Jovian League on July 1. The feature was a dinner given at the Sunrise Auto Club, located nine miles from the city. The members and guests went out in 20 automobiles. J. A. Cayce was the toastmaster and the speakers included Ell C. Bennett, of St. Louis, national Mercury; B. C. Edgar and J. E. Garner. About 75 men of the industry were present. The Nashville Jovians had charge of the lighting arrangements at a dinner given to the Tennessee militia, which was mobilized at Nashville, by the commercial organizations of the city, the tables being spread in the open air, on Capitol Boulevard. Festoons of lights hung above the tables formed part of the decorations.

Joseph Henry Statue Planned.—A committee has been formed and a fund of $16,000 already pledged towards a metal statue of Joseph Henry to be erected in the park of the Boys' Academy, Albany, N. Y., a spot which lies in the civic center of the city. It was while teaching at the Boys' Academy that Henry conducted his immortal experiments in self induction and related phenomena, and it is therefore fitting that a suitable memorial be erected at the site proposed. Henry P. Warren, of Albany Boys' Academy, is chairman of the committee and John M. Clarke, director of the New York State Museum, is secretary-treasurer. Among those on the committee are Alexander Graham Bell, Thomas Edison, Theodore N. Vail, E. W. Rice, Jr., Michael A. Pupin, and J. J. Carty. It is stated that contributions will be received with appreciation, and may be addressed to Secretary Clarke's office in Albany, N. Y.

New Power Plant for Spokane.—The contract for the construction of a steam heating and electric power plant for the Spokane Heat, Light & Power Company, of Spokane, Wash., formerly the Merchants Central Heating Company, has been awarded to Porter Brothers, of Spokane, for about $88,000. The proposed structure will be located on the company's site on the south side of the Northern Pacific right of way, between Post and Lincoln Streets. It will be constructed of brick and steel with ornamental terra-cotta trimmings. The best type of construction will be employed and automatic devices installed for delivering the coal from the cars to the furnaces and removing the ashes. In the boiler room the initial installation will consist of ten 700-horsepower boilers and three turbogenerators with a combined capacity of 6,000 kilowatts. E. Darrow, manager of the company, reports that his company expects to have its electrical plant in operation by September 15. Commercial lighting contracts are now being secured. Eventually, after the consumers in the down-town district have been served, the company plans the extension of its distribution lines into the residential sections.

Power Company Donates Flag.—Formal presentation by the Alabama Power Company of an electrical flag to the city of New Decatur, Ala., took place July 7. The flag is placed on the city high school. Samuel Blackwell made the presentation for the power company and it was accepted by Mayor Hardage, the mayor's wife pressing the button, switching on the lights. Patriotic exercises marked the occasion.

Hydroelectric Plant on Tennessee River Projected.—A meeting of representatives of the principal cities and commercial organizations of the South was held at Nashville, Tenn., on July 14 to formulate plans for bringing about the location of a big hydroelectric plant at Muscle Shoals, Ala., for the manufacture of nitrates. The measure for providing such a plant is now pending in Congress and it is believed by those interested in this section that if the act is passed, it will be located at Muscle Shoals on the Tennessee River, at which site surveys have already been made by the War Department. The construction of two dams at this point, according to the report of War Department engineers, together with storage water on tributary waters, will develop 680,000 horsepower, to be used for the operation of a plant at which munitions can be manufactured in time of war and cyanamid in time of peace.

Municipal Agitation Started in Muncie.—The City Council of Muncie, Ind., has passed a resolution asking the circuit court to appoint appraisers for the city electric distribution system. Also it has ordered the board of public works to advertise for bids for supplying electricity to Muncie consumers. At the present time the Muncie Electric Light Company is supplying the city with light and heat. The movement which has just started will attempt to take this out of the hands of a private corporation and substitute municipal ownership in its stead. The city council has declared itself in favor of municipal ownership, but has received opposition from the Commercial Club of that city which, in a report of a special committee, supported the local company in its rates on electricity and steam heat. The commitee reported that rates of the local company compared favorably to those of other cities of Indiana. The rate is 7.5 cents per kilowatt-hour.

Lexington Franchise Controversy to Be Settled November 1.—November 1 has been agreed on as the date on which the new franchise to be bought from the city of Lexington, Ky., by the Lexington Utilities Company, will go into effect. The price has been fixed at $10,000 and the utilities company is expected to be the only bidder. The position of the company was set forth frankly in a statement by James M. Boyle, of the engineering firm of Sanderson & Porter, New York, representing the utilities company. Mr. Boyle said in part: "The Lexington Utilities Company feels that it is under obligations to the mayor and commissioners for allowing us to participate in the deliberations preliminary to the framing of this ordinance. The company will bid for the franchise, of course. The cut in rates is very great and will be felt severely by the company. While we can only estimate the amount of new business which will come to the company under these rates, the fact is apparent that so deep a cut in its present rates means many thousands of dollars loss in gross business. With this situation before it the company has got to hustle for new business. We must ask the consideration of the people, for there is a tremendous amount of work to be done and initial expense incurred, to meet these new conditions. We feel that with this franchise in operation the company will retain the confidence and good will of the community, for the company intends to meet the spirit of the franchise to the limit and it wants to meet, at every point, the public demand."

Use of Electricity in Coal-Mining Operations

The Rapid Extension of the Use of Electricity in Coal Mining Due to Its Advantages and Practically Universal Applicability —Tonnage Costs Are Decreased by Central-Station Service

Industrial Power Series.—Article No. 171.

IN THE early days of the coal-mining industry crude methods of production were practiced. As the country expanded industrially, with an accompanying demand for fuel, it became necessary to increase the production of coal. The crude methods in use were not adequate to fulfill the requirements made on the industry, and it was necessary to devise means of keeping up with this increasing demand.

The development of the steam engine afforded a ready means of meeting the demand for greater coal production. It was thought that with the low cost of fuel the use of steam engines for all classes of work, such as hauling, hoisting, ventilation, etc., would be adequate and economical. The use of steam, however, has always been comparatively difficult and costly, and in even the most simple underground operations its use served to diminish the factor of safety in an industry in which potential danger to the workmen must always be a matter of primary consideration.

Compressed air met some of the objections to the use of steam in underground coal-mining operations, and as a result was extensively used. Both steam and compressed air are expensive and more or less flexible as to application and did not satisfactorily meet the severe requirements brought about by the increasing length of entries and complexity in the layout of the underground workings.

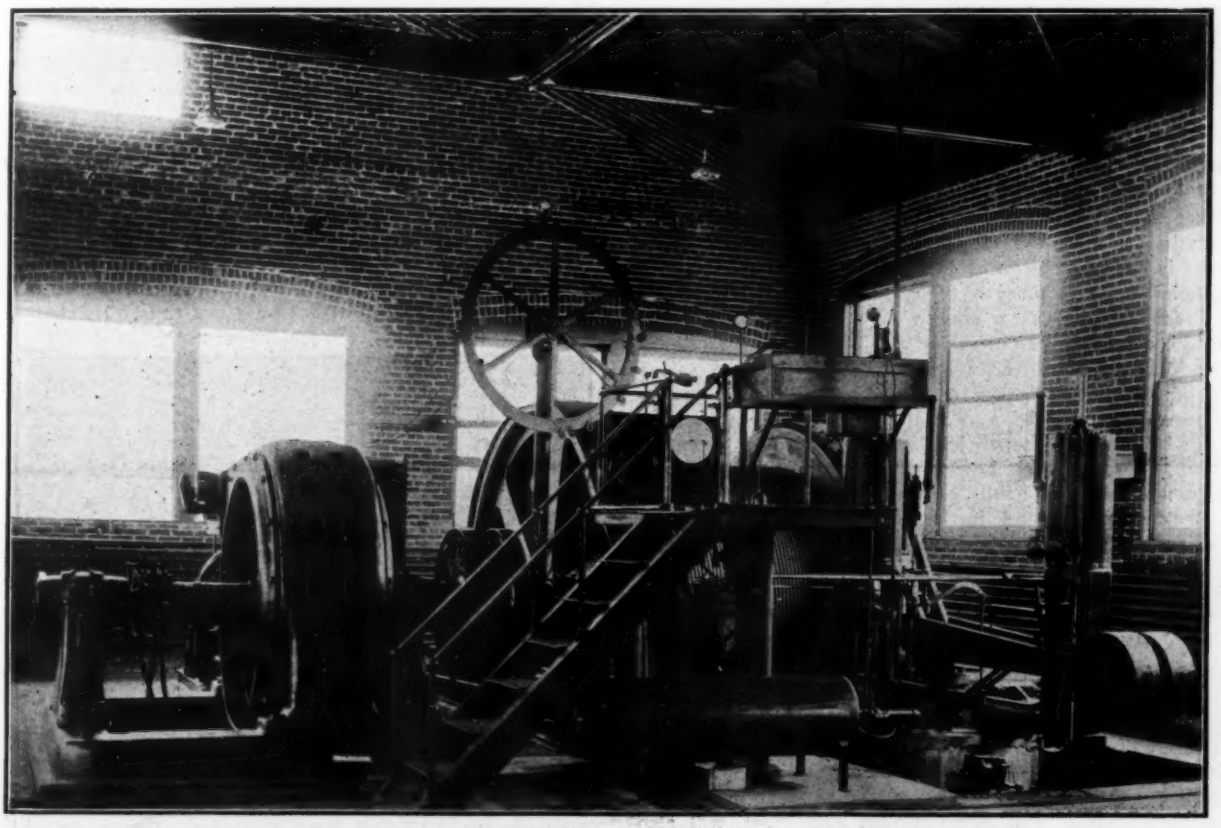
With the advent of electrical service and its successful application to all phases of coal-mining work, a flexible and simple type of power was found which could be satisfactorily used, both for the surface and underground work. As a result steam was entirely displaced for all cutting and hauling operations, and in most cases for pumping. It still finds considerable use in hoisting workings, in driving ventilating fans and in tipple work, but it is rapidly being replaced even for these classes of work. The use of compressed air is seldom ever found in any except gaseous mines, but here, too, the continued development of electrical apparatus has made possible the use of this type of equipment in the most gaseous mines.

Reasons for Use of Electricity in Coal Mining.

The use of electricity in coal mining is not new, as it has been employed to a limited extent for many years, but the rapid extension which has recently characterized its application is due to several causes, the more important of which can be briefly outlined as follows:

First—The improved efficiencies of modern electrical machinery in general, and the increasing use of alternating current, with its greater flexibility in transmission over distances which are beyond the economical limit of direct-current distribution.

Second—The specialization of the electrical manufacturing companies' engineers on the power requirements peculiar to coal-mining operations.



General View of 700-Horsepower Hoist at Crows Nest Mine, Keystone Coal & Coke Company.

Exterior View of Peabody Coal Company's Plant at Kincaid, Ill., Showing Head Frame Combined Hoist House and Substation.

Third—The growing appreciation by the engineers of the mining companies of the advantages of electric power and their active co-operation in the solution of the problems entailed by special conditions.

Fourth—The notable operating economies which have resulted in numerous installations utilizing electric power, even under the most severe service conditions, and the attainment in practically every case of an increased output for a given power consumption.

Fifth—The necessity for the development of coal fields in which the geological conditions were such that the mines could not be economically operated by the older methods and the continually increasing distances between the working faces and delivery points in mines already in operation, which tended to render electric haulage nearly imperative.

Sixth—The coming of the central station into the coal-mining field, selling electricity at rates that are economical to the coal operator, renders service that frequently results in increased output without change in investment or consumption, with corresponding decreased tonnage costs due to greater flexibility in application and to greater uniformity of supply. In new operations the first cost for power-station equipment can be reduced by the cost of the engines, boilers and auxiliary equipment, together with decreased cost for buildings and distributing circuits.

That the above causes are all given the practical consideration which their effect on operating costs so fully merits is clearly demonstrated by the fact that in all recent coal-mining developments of appreciable size electricity has been adopted as a source of applied power, either wholly or in part. In many of the older workings it has been found that true economy would sanction the scrapping of a large percentage of the steam power equipment and its replacement by a centrally located generating station or by the purchase of the electric power from a central station. In some cases, however, the engineers of the mining companies are not fully aware of the inherent economy of electric service and its practically universal applicability, and are, therefore, disinclined to supersede older equipment which, while not so economical in operation, has still proven its practical utility.

Application of Electricity in Coal Mining.

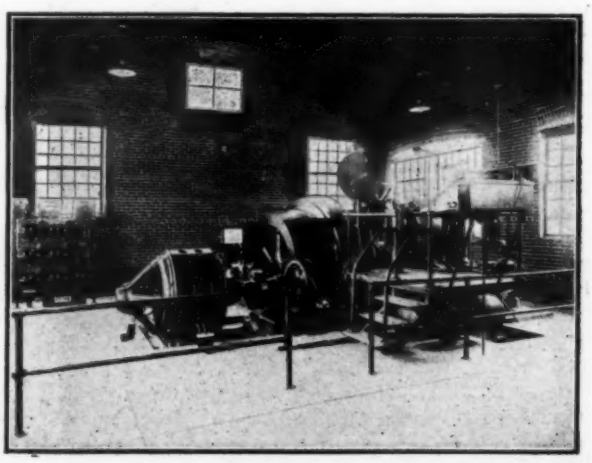
In the following it is intended to discuss in a general way the conditions affecting the generation, transmission and application of electricity, and also the increasing use of central-station power. The advantages of electric motor drive for all the different phases of coal-mining operations, together with typical examples of the application of both alternating-current and direct-current equipment, will also be discussed.

The principal advantage of electricity is its flexibility as to generation, transmission and application. The power plant may be located at any convenient point, usually at or near the pit mouth or the tipple and near to some adequate water supply. The generators may be driven by steam or gas engines or by steam turbines, and the electricity is transmitted to the several points of application over copper wires, which are easy to put up and to maintain. No steam or air lines are required, and there is no loss of steam or drop in pressure, except the drop in voltage due to the resistance of the copper conductors to the passage of the current, which loss may be compensated for by generating at a sufficiently high voltage, usually 10 per cent above that required by the machines, to keep the impressed voltage at the desired value. These losses can be reduced to a minimum by using sufficient copper in the feeder lines, by properly bonding all return circuits and by being careful that all grounds are securely made so as to prevent leakage. By the elimination of long lines of steam or air piping the first cost of the installation and the upkeep charges are made a minimum, and there is a very high factor of safety against breakdown, due to interruptions of the power supply caused by power-house troubles or by broken lines. Where there is a group of mines to be served an alternating-current station may be constructed and the power transmitted at high voltage to the various points of application, being reduced to a safe potential by means of stationary step-down transformers, and then changed to direct current through rotary transforming equipment. Electric wires can be easily and safely used in places where steam lines would introduce an element of danger, as in shafts, and they can be run in bore holes from the surface to the point of application, or in shafts already in use for other purposes.

Besides being flexible and simple as to transmission and application, electricity presents a system of power transmission that may be quickly and economically extended to meet changes involved in the progress of development.

Central-Station Service.

Not so very long ago it would have seemed preposterous to have even suggested that central-station service could be profitably and satisfactorily substituted for the old isolated plant operated by coal direct from the face of the working inside the mine. The unexpected, as in many other instances, has been almost prematurely realized, for today many mines are using central-station service, while many others are in the process of coming to such usage. The significance of this will be realized when it is learned that recent census figures give a total production of coal in the United States at over 500,000,000 tons. In view of



300-Horsepower, 2,300-Volt Hoist Equipment, Greensburg (Pa.) Coal Company.

these figures it can be readily appreciated what the saving of a few cents per ton means, not only to the producer but to the consumer. The application of central-station service to the great majority of coal-mining plants makes possible appreciable savings, and with the increasing development of the hydroelectric industries will leave more coal available for sale on the open market. The power is usually delivered over high-voltage alternating-current lines to the coal-mining plant, where it is reduced and transformed to direct current in any amount required.

On account of the ability to use the electric motor, the power supply may be brought directly to its point of application, without reference to the power station or to any line shafting, and individual or group drive is possible on all equipment, thus economizing in power and space and securing a direct, efficient and economical application. The flexibility of motor drive permits of the use of portable equipment, thus allowing movement from place to place without affecting any other operation.

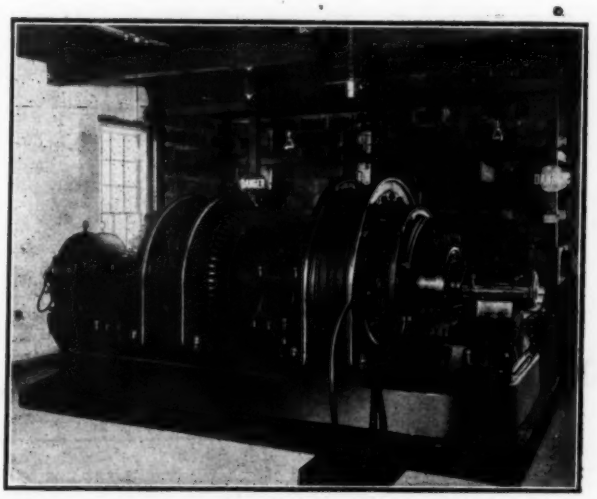
Locomotives for Haulage Work.

For haulage work the electric locomotive has demonstrated its undoubted superiority for meeting all of the many severe conditions encountered. It is mechanically strong, dependable and efficient, is compact in construction, simple in control, and can be readily adapted to all heights of coal and to grades within reason. Except in special cases, it is evident that the steam locomotive cannot be safely used in mines on account of its size and of the fact that it gives off an abundance of obnoxious gases. The compressed air locomotive has a low efficiency, about 25 to 30 per cent, is more cumbersome than an electric locomotive of the same capacity, has a limited radius of action and requires frequent recharging from stations located inside the mine. It is higher in first cost, has a higher upkeep cost and is generally much less economical than the electric locomotive. The gasoline locomotive has found some application, but has its objections and limiting features. The storage-battery locomotive is also coming into use, but for haulage purposes is not generally suitable on account of the first cost, its limited radius of action, its speed limitations and its general unwieldiness, due to the necessity for a large battery to satisfactorily meet the severe requirements of coal-mining work.

Electric Mine Locomotives.

The usual type of electric mine locomotive is equipped with one, two or three direct-current series-wound motors, designed for either 250 or 500 volts. This gives an equipment with a high starting torque and high running speeds on the level. A fine degree of speed control is possible and the equipment is efficient and flexible in control and operation. One trolley, with a bonded track return, is required. The alternating-current locomotive is not as efficient in operation, and does not have the same flexibility of control. Two trolleys and a track return are required, thus increasing the investment and upkeep costs. In order to get the best results the track return should be well bonded, so as to reduce leakage to a minimum, with cross bonding at intervals of from 200 to 400 feet. The single-motor locomotive finds its widest application when used, as in small locomotives, for gathering work. Apparently its only advantage is that both sets of wheels are connected together either by gears or by chains. In the former case spring suspension of the motor in the frame is not possible, as it is necessary to keep the alinement and mesh of the gears and pinions exact. This results in a rigid, inflexible equipment, which is hard on the track and comparatively high in upkeep cost. The two axles being mechanically connected, it is not possible to slip one pair of wheels without the other slipping at the same time. Another type of locomotive, and that most universally used, is the two-motor type, in which a motor is spring suspended on each axle and connected to it through gear and pinion. The motors can either be swung between the axles, or in tandem, or both motors outside the wheels. The tandem combination is the one most generally used, as it gives a better distribution of weight, requires a normal wheel base, and the motors are readily accessible. A third type is generally found only in the very large sizes and contains three motors, tandem hung. The center pair of wheels are flangeless in order to enable negotiation of curves without difficulty. Essentially a mining locomotive consists of two rolled steel side frames mounted on wheels held in spring journals either outside or inside the frames, according to the width of entry. The motors are spring suspended on the axles inside the frames. Wooden bumpers mounted in steel channel frames connect the side frames at either end, and all locomotives are provided with reversing controllers and any necessary protective devices.

For gathering work, small, one or two-motor locomotives, with or without cable-reel attachments, are used. These locomotives operate usually on the feeders to the main entry and gather the cars from the different rooms to the main haulageway, where they are collected by the large haulage locomotive and taken to the outside for loading.



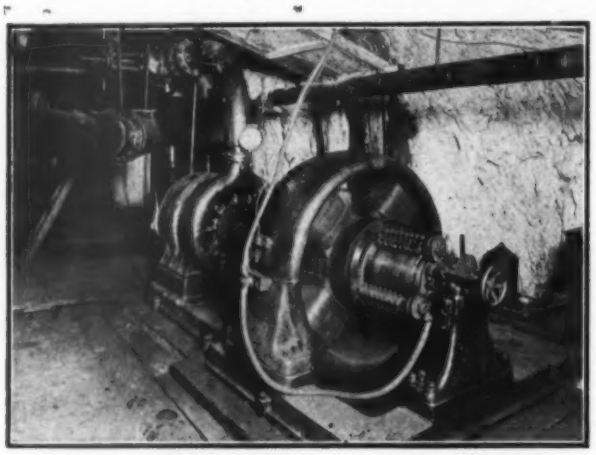
300-Kilowatt, Synchronous Self-Starting Motor-Generator Set, Installed by Meadowlands Coal Company, Arden, Pa.

When it is desired to go up into a room to get a car the cable on the cable reel is attached to the trolley outside the room, and the locomotive proceeds into the room by means of power received through this cable. The reel is operated by a small series-wound motor and is unreeled by the forward movement of the locomotive against the tendency of the reel motor to revolve in the opposite direction, thus keeping the cable taut and preventing knotting. When the locomotive is coming out of the room into the entry, the cable is wound on the reel by the accelerated rotation of the motor. This reel may be at the back end of the locomotive with its axis horizontal, or it may be on the top of the locomotive with its axis in a vertical plane. Another type of locomotive is the winding-reel locomotive. This locomotive has a motor-operated drum with a steel cable attached. The locomotive stands in the entry while the operator goes into the room with the cable and attaches it to the car. The drum is then reeled up by the motor and pulls the car out of the room onto the entry. A combination of the cable reel and winding reel features in one locomotive is also sometimes used.

Storage-Battery Locomotives.

Another type of gathering locomotive coming into use is the storage battery class. The locomotive consists es-

sentially of the general layout of the standard haulage locomotive, with the addition of a battery located on the top of the locomotive, or which may be suspended between the frames. The battery has to be periodically charged from some outside source of power, and for this purpose it is the general practice to erect charging stations of suitable size at convenient points of assembly, inside or outside the mine. This charging equipment is automatic in operation and can be operated at night by the watchman or by anyone else designated. The battery discharges in the daytime in the work of bringing out the coal and can be recharged at night so as to be ready for the next day's work. The results obtained from the storage-battery locomotive equipments that have been sold have been very satisfactory, and in some instances have solved increasingly difficult haulage and gathering problems. On account of the self-contained feature of the battery equipment no rail return circuit is necessary, and the equipment can operate without relation to trolley location or rail material. The essential requirement is that the equipment be mechanically rugged in design and construction, and that a battery of sufficient mechanical strength be selected. Without a battery that operates satisfactorily and that is able to withstand the severe duty encountered in coal-mining work,



150-Horsepower, 220-Volt, 700 to 1200-Revolutions-per-Minute Motor, Direct Connected to Four-Stage, Ten-Inch Centrifugal Pump, Installed in North Franklin Colliery, Trevorton, Pa.

the equipment, however good it may otherwise be, will not be of much practical use. The efficiency of the haulage system in a mine is usually the determining factor in the commercial success of a mining operation. No matter how efficiently the coal is cut and hoisted, or how well the pumping and ventilation are looked after, if the different phases of the haulage and gathering systems are not properly co-ordinated and worked out the equipment cannot be kept working at full efficiency, both as regards economy and haulage production.

Electric Mining Machines.

Another important operation is the actual mining of the coal. As usually found, the coal lies in veins, varying in thickness from a few inches to many feet. Commercially workable veins are usually not less than two to three feet in thickness. Long galleries are laid out and rooms are turned off on either side, varying from 20 to 40 feet in width and from 100 to 200 or 300 feet in length. At first all coal was mined with pick and shovel. Small holes were drilled into the coal and then some suitable explosive, usually dynamite, put in. This charge was set off by means of a fuse, the explosion breaking up the coal so that it could be shoveled into cars. This method is still in use in many mines, but where the coal is too hard to be satisfactorily mined in this manner the coal seam is usually undercut next to the floor by means of a motor-driven cutter and then brought down by means of some suitable explosive, as explained above.

Essentially the typical modern coal cutter is mounted on a self-propelling truck and all its movements in loading upon or unloading from the truck and during the process of mining are made without hand labor and under its own power. The motive power is supplied by a specially designed, inclosed, direct-current motor, provided with a simple rheostatic controller and wound for the same voltage as the mining locomotives, so that energy can be supplied from the same circuit as that supplying the haulage system. The power is transmitted to the cutter motor by means of a flexible cable attached to one of the copper feeders from the power supply.

During the year 1909 the amount of coal mined by machinery in the United States was in excess of 142,500,000 tons, or more than 38 per cent of the total production for that year, about 13,000 machines of various types being used. Since their introduction the use of the motor-driven type has increased steadily and more rapidly than other forms, owing to the superior flexibility and economy of the electrical distribution and application of power. In the state of Pennsylvania alone the tonnage produced by electric mining machines in 1903 was about 18,000,000, while in 1909 it had risen to more than 31,000,000 tons.

In extremely gaseous mines coal is mined by means of air drills and air cutters, but such usage is decreasing proportionately with the design of explosion-proof electric motors suitable for the work to be performed.

Haulage Systems.

There are three classes of mines as regards the haulage system. They are drift mines, where the main haulage comes outside the mines on a level; slope mines, where the main haulage ends at the foot of an incline or slope, from which point the loaded coal cars are carried to the surface by means of a chain haul; and shaft mines, in which the main haulage terminates at the bottom of a shaft sunk down from the surface, and from which point the coal is hoisted to the surface in a cage or skip.

The slope mine usually presents no particular difficulties as regards tonnage, as with a proper arrangement of tracks, switches and sidings, and with a chain of sufficient strength and speed the output from the mine to the foot of the slope can be easily and quickly handled.

In a shaft mine the lift is vertical, it generally being possible to hoist only one loaded car of coal at a time. The shaft usually contains two cages, one descending with an empty car as the other rises with a loaded car. Its importance is evident when it is considered that the main or hoisting shaft represents, to a certain extent, the principal artery of the entire mine. It is the connecting link between the underground workings and the surface coal handling and shipping equipment, just as the Mississippi River is the outlet for all the many trbutary streams that drain the central portion of the United States. The entire production of the mine must pass through the shaft on its way from the several points of production to the shipping station. Any interruption or breakdown in the hoisting machinery causes congestion inside the mine and idleness outside, not to speak of its effect on the production. In sinking a shaft, careful consideration must be given to its location with relation to the coal field to be worked. The technical problem is to cover the greatest possible area of a mine with one main shaft, and to install a suitable hoist that combines maximum efficiency with high economy and thorough reliability. Endeavors to solve this problem have led, during the last century, from hoists driven by flowing water to steam engines, and from the latter to electric motors. Prior to 1900 the electric hoist was not extensively used, but now, rather than being the exception in new

Ten-Ton Baldwin-Westinghouse Bar-Steel Frame Mining Locomotive.

installations, it is coming to be the rule. Due to its rotary motion and high starting torque, the electric motor affords an ideal method of applying power to hoists. The power is uniformly applied throughout the operating cycle, and the power demand is limited to the time during which the hoist is in actual operation. This means not only an actual saving in power consumption but, under special conditions, enables the application of regenerative braking. The motor-driven hoist is simple and compact, operating at a high relative economy and free from all presence of steam. It is flexible, reliable and simple in operation and practically fool proof. Several different types and combinations of motor-driven hoists are available, each with its own characteristic advantages and limitations. Suffice it to say that each application presents a new and particular problem in itself, the correct solution of which can only be arrived at after a thorough investigation of the several factors entering into the operation has been carefully made and all considered in their proper relation.

Pumping Equipment.

The relative importance of the pumping equipment is dependent on the geologic conditions encountered. In many mines the pumping problem is very simple and easily handled, while in other mines it may form the most serious problem in the operation of the mine. In case a mine is much burdened with water, its continuous operation is dependent on the operating efficiency of the pumping system. It is, therefore, imperatively necessary that reliable, simple and efficient equipment be installed.. The pumping cost for a mine may be considerable. On account of the relatively high over-all efficiency of a motor-driven pump, its adoption would effect a reduced operating cost and have an influence not only on tonnage costs but also on the obtainable margin of profit. Besides being more efficient and economical in operation and upkeep, the pump requires much less attention and long, inefficient steam pipe lines are obviated. Pumps for mining work are usually divided into four classes, as follows: sinking pumps, used in development work, in sumps and for emptying flooded mines; main sump pumps, permanently installed inside the mine at a previously determined sump or main water hole; auxiliary pumps, feeding into the main sump from other points of the mine; and portable pumps for miscellaneous uses. Most pumps designed for steam operation can be adapted to motor drive. Centrifugal pumps are always best driven with a direct-connected motor. In many mines it is possible to do the pumping at night, thus equalizing the load on the generators by relieving them of pumping duty dur- in the daytime when the energy generated is most needed for cutting and handling the coal.

Motor-driven pumps may be moved about inside the mine and may be made entirely automatic in operation, reducing attendance charges to a minimum.

Ventilating Systems.

Of primary importance, especially in gaseous mines, is the uninterrupted operation of the ventilating system. The ventilation of mines differs somewhat from other ventilation problems, in that a variable air supply is required. Mechanical ventilation by means of a rotary blower or of an exhaust fan, which gives a positive and fully controllable supply of air, is used. Where possible, the fans should be direct connected to motors, but in cases where old steam fans are changed to motor drive it is usually necessary to use a belt. Fans may be remote controlled, and synchronous motors, where necessary or desirable for power-factor corrective features, may be used. Low starting requirements are attained by shuttering of the fan. There are many special types of motors for use in operating fans, but the best method is to use a motor that can operate at normal speed, giving a maximum volume of air in the daytime and at a reduced speed, usually one-half of normal, at night. Careful regard for the proper operation of fans will realize considerable savings in operating and tonnage costs.

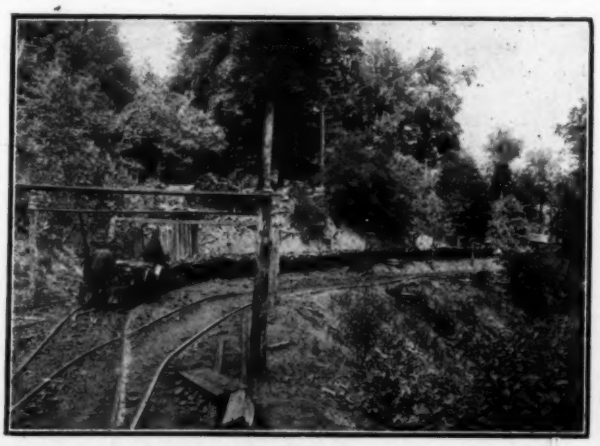
Miscellaneous Electric Equipment.

Besides the equipment mentioned in the foregoing, motors are usually used to operate a variety of miscellaneous equipment installed about a mine.

When motors were first applied to the centrifugal type of rock and coal crushers it was considered advisable to retain belt drive, due to the severe starting conditions, excessive vibration and the possibility of the operating requirements resulting in stalling or injuring the motor. Familiarity with the use of electric motors, however, induced many of the engineers of the mining companies to attempt to direct drive and both alternating and direct-current motors are now successfully applied in this manner, being connected to the crusher shaft through flexible couplings.

The power losses involved in the operation of an engine-driven breaker are unavoidably great, due to the complex mechanical transmission of the energy through numerous shafts, pulleys, sprockets, sheaves, belts, ropes and chains interposed between the prime mover and the machinery actually performing useful work, and which, in addition to consuming a large proportion of the available energy, occupy a very considerable amount of space and serve to complicate the internal arrangement of the breaker. Owing to the severe service conditions the belt renewals and genral repair work constitute a continuous and heavy expense and very little saving in the primary power required is possible when the breaker is operating on partial loads.

A realization of the inefficiency of engine drive has led some of the coal operators to equip breakers of modern



Five-Ton Mining Locomotive Used by Proctor Coal Company, Red Ash, Ky.

construction with individual motor drive, which, by eliminating a large percentage of the shafting, belting, etc., effects a great reduction in the power losses and maintenance charges, and by rendering it possible to run the various portions of the machinery independently, makes the power cost, when only part of the equipment is used, directly proportional to the amount of productive work.

For driving tipples individual motors have heretofore been more generally used than in breakers, and the typical modern steel tipple is usually equipped with separate motors for the conveyors, picking tables, screens, crushers, etc., although in some cases they are driven in groups by one or more large motors.

Where long conveyor or scraper lines are used the power waste inherent in rope transmission may be reduced by using a centrally located motor or individual motors for separate sections.

Other minor uses of electricity are possible and all surface auxiliaries will, as a rule, benefit by the use of electric motive power. The use of electricity for lighting throughout the mine, and also in the miner's cap by means of a storage-battery attachment, are useful and interesting features of its application. Elaborate telephone and signaling systems, made possible by electricity, act to co-ordinate the work throughout the entire mine and make for safety to the individual and maximum production at the tipple.

ELECTRICITY IN AGRICULTURE.

A Report of the Activities in England Towards Electrifying Farms.

At the annual convention of the Municipal Electrical Association held in June in London at the Institution of Electrical Engineers, W. T. Kerr, city electrical engineer of Hereford, urged that greater attention should be given to the use of electricity in farming in England by electric supply authorities, engineers and manufacturers. In Germany and France official recognition had been given to the utility of numerous agricultural electric supply schemes. In the United States, California used more power per head of population than any other American state. Canada, Australia, New Zealand, Italy, Austria, Switzerland, Denmark and Holland also had important examples of electrical installation system and service for agriculture. Mr. Kerr based his advice and the conclusions which he put before the convention upon some years' experience in farm supply work in his own neighborhood, Hereford. He holds that there is an enormous business of a similar kind awaiting development in England. In Hereford district a system of light transmission lines has been erected to reach agricultural consumers. They are built with larch poles, 28 feet long, with cross-arms of quarter oak 2 feet 6 inches by 3 inches by 3 inches, the bottom arm 3 feet. The lines are usually now made up to No. 10 B. S. G. bare stranded aluminum weighing about 0.032 pound to the yard, with two No. 12 galvanized-iron guard wires below, which are also used as neutral, the supply being given at 440 volts, three wire (220 volts for lighting). The total cost, including labor, works out at $550 per mile. These lines withstood two recent gales without a breakdown. The longest line is 3,400 yards from the generating station, 1,200 yards of which is by overhead lines; these radiate in five districts from the station to an average distance of 3,000 yards. To prevent cattle from rubbing against the poles they are placed close into the hedges. Tappings to consumers are taken off by means of a twin-lead cable clipped to the pole. It is important to seal both ends of the cable where the leads are taken off, and this is usually done at the top of the pole by securing a small type sealing box to the pole and taking-off leads, leaving a short bare space on the wire between the lead-covered and rubber-covered leads where the thimble is sweated, and afterwards sealing this with compound. The connection to the aluminum wire is made by means of a "jim crow" shaped clip, which grips the wire in two positions, the lead being sweated to a screw used for tightening in the center, and the whole joint afterwards painted over with aluminum paint; no trouble whatever has been experienced with such a joint, although one section has been in constant use for nine years, connecting up a supply to a 50-horsepower motor from an aluminum overhead line running alongside a main line railway.

In an average case, said Mr. Kerr, a 10-horsepower motor will meet all the requirements of a farm except for thrashing and cider milling, but motors up to 20 horsepower have been hired out for these purposes, which are only seasonable jobs and do not require a permanent fixing. He gave descriptive information concerning a dairy installation which included a vacuum pump for the milking machinery. This machine requires 1.5 horsepower and is used twice daily for two hours in the morning and 1.25 hours in the afternoon. The cows milked average about 70, and the machinery capacity is for 88. The farm bailiff states that it would require five men at least, who are expert milkers, to do the work in the same time, or with his present staff five or six hours a day longer. In regard to root-pulping and chaff-cutting experience shows that owing to the easy starting of an electric motor the exact quantity of food can be cut and mixed fresh as required, a very important result being a greater yield of cream in the milk. For these and various other services on this particular farm the units consumed during the year 1915 quantity of food can be cut and mixed fresh as required, reached $125 or an average of $2.30.

The author showed that the use of electricity from the farmers' standpoint means a considerable saving in labor. He said that a scheme of high-tension three-phase supply had been prepared for the Hereford area, to be carried out after the war, there being a growing demand for electricity from farmers and private residences that could not be met by a 440-volt three-wire supply. There were as a rule five farms to the mile along an average road, and many ordinary country residences. An average revenue of at least $500 per annum would be yielded from the five farms and between $100 and $1,000 from the private houses, as there were large country residences which were only too anxious to have such a permanent source of supply, paying twelve cents per unit for it. Mr. Kerr said that existing data showed that the average consumption of current in an agricultural district with a population of 22,500 was 58 kilowatt-hours per head, and for the population of the county of Hereford (114,296) he estimated a possible sale of 6,637,000 units; that is in an area of 40 miles long by 35 miles wide, with a central distributing point.

Mr. Kerr later gave some particulars of the experiments in electro culture that have been carried out with most favorable results by J. S. Newman and by Miss Dudgeon. We have already briefly referred in these pages to Miss Dudgeon's results with electrified crops and oats. This lady is continuing her experiments in Scotland. Current is obtained from a 30-volt storage battery used with a spark coil and rectifying vacuum valves. Such expensive instruments, however, were quite out of the question for an ordinary farmer, besides requiring a certain amount of expert knowledge to get the best results. Mr. Kerr said that if a high-tension alternating supply were available, a small transformer with valves for rectifying and an automatic time-switch for controlling would be less costly, and could be built up in such a manner that it would be quite safe to place it on any farm. The current consumption alone would not be great, but the increased yield per acre of food-stuff would be of value to the country.

COMMERCIAL PRACTICE

New-Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

Advertisements Help Nashville Wiring Campaign.

The Nashville (Tenn.) Railway & Light Company is in the midst of a vigorous house-wiring campaign which has several interesting features—attractive to house owners of the city, judging from the response made to the accompanying advertisement which was placed in the daily newspapers. "No cash payment" is one of the specially approved provisions of the offer, while to all who contract for wiring the company provides a $4 fixture free. "We will wire your home complete on easy monthly payments," says the company in its advertising. "No payments due for 30 days and then—a dollar or two a month—you will never miss the money."

A prominent feature of the advertisements is a wiring table, to which attention is directed by the following: "How many lights do you need? See wiring table. Note how little it will cost to wire your home." The table notes costs for houses of from three to ten rooms, prices ranging from $11 to $25.80, and payments ranging from $1 to $2.15 monthly.

Have Your Home Wired Now—
Get a $4 Electric Fixture FREE
—you will want a chandelier for your parlor or reception hall—this special offer is just what you have been waiting for—a real bargain opportunity
Think how often you have all wished for ELECTRIC LIGHT. Think of the many conveniences—the electric iron, the electric fan, the electric washer, and the many other time and labor savers that are always at your service—if your home is wired for ELECTRICITY.
This SPECIAL OFFER places Electricity within reach of every home. You enjoy the comforts of electric service while paying for your wiring.
Pay Nothing Cash
We will wire your home complete on EASY MONTHLY PAYMENTS. No payments due for thirty days, and then—a dollar or two a month—you will never miss the money.
And remember—we are not charging you any more for your wiring—there has been no advance in wiring prices—
We Give You This Electric Chain Fixture—
Absolutely Free!
You really cannot afford to let this money-saving offer go by. You not only get a $4.00 Electric Fixture Free—you enjoy electricity in your home while paying for your wiring.
How many lights do you need? See WIRING TABLE. Note how little it will cost to wire your home—the small monthly payments. A whole year to pay—without interest.
We will gladly send the Estimate Man to answer all questions—there's no obligation.
WIRING TABLE
NO CASH PAYMENT
3 ROOMS WIRED FOR $11.00
ONLY $1.00 A MONTH
4 ROOMS WIRED FOR $13.80
ONLY $1.15 A MONTH
5 ROOMS WIRED FOR $15.00
ONLY $1.25 A MONTH
6 ROOMS WIRED FOR $16.20
ONLY $1.35 A MONTH
7 ROOMS WIRED FOR $18.60
ONLY $1.55 A MONTH
8 ROOMS WIRED FOR $21.00
ONLY $1.75 A MONTH
9 ROOMS WIRED FOR $23.40
ONLY $1.95 A MONTH
10 ROOMS WIRED FOR $25.80
ONLY $2.15 A MONTH
Remember—This Offer Is Good for a Limited Time Only—Decide Today
CALL MAIN 5000 OR COME BY OUR OFFICE
Nashville Railway & Light Co.

Nashville House-Wiring Advertisement.

Commercial Activities in Rhode Island.

The Narragansett Electric Lighting Company, Providence, R. I., has closed a three months' house-wiring campaign, on lines described in a previous issue, the result being 202 new customers.

Between April 1 and July 1 the company sold at its electric shop 375 Eureka vacuum cleaners, most of them retailing at $34.25 each, with attachments. The sales were mostly on terms of $2.50 down and $2.50 per month, the total price being no higher than the cash price.

This summer a campaign for the sale of electric fans is being pushed. The company is featuring an 8-inch fan, which is being sold at $5.50. It is believed that many householders will buy a low-priced fan who would not pay $12 or $15 for a larger one. Purchasers are given 30 days in which to pay. The superintendent of the department does not consider it good business for a central station to sell fans on long terms. Circulars advertising the 8-inch fan have been mailed with lighting bills to the 25,000 customers.

Another campaign to be undertaken soon will be for the sale of portable lamps. These will be sold for 20 per cent down and 10 per cent a month. Last year nearly 1,000 portables were sold.

A clever "wrinkle" is used in the appliance store. Instead of setting forth the retail price of the goods, a tag is used on which the monthly payment is prominently given, and on the reverse side is the retail price and first payment. This device excites the interest of patrons, whose first impression is the small payments required to secure the article. The tags are of celluloid, allowing the figures to be removed and new figures written on them, thus enabling them to be used again and again.

The company on July 1 reduced its maximum lighting rate from 10 cents to 9 cents a kilowatt-hour.

Window Display Aids Fan Sales.

The Consumers Electric Light & Power Company, of New Orleans, is pushing fan sales very energetically and developed considerable business last month as a result of a very clever window display in which the window was turned into a sea-side scene, by the use of a tank of water surrounded by sand to form the beach. In this tank were little sail boats driven about by the action of an oscillating fan and little kewpie dolls were used to give the human interest touch.

As a further ad for fans a handsome water cooler was installed in the Consumers Company's sales room with a rack of sanitary drinking cups. About it were hangers and placard reading "Several ways of keeping cool—one of them is to drink plenty of ice water. Another is to use an electric fan."

Range Sales Increasing in Indianapolis.

While electric ranges have been on the market and have been known for their practicability for the last nine years throughout the western states of Kansas, California, Colorado and the eastern states of New Jersey, eastern Pennsylvania and Maine, their use in the central states has been restricted, due largely to the natural resources in that district. In some localities natural and artificial gas with low rates was prevalent, while rates for electricity were high. This is especially true of Indiana, and explains the absence of the range in that state. Prior to the year 1916 the number of ranges sold was small, and those which were sold were unsatisfactory.

Under the direction of C. D. Deeds, of the Indianapolis (Ind.) Light & Heat Company, the market on electrical ranges was investigated in that city. A range was selected and a campaign of putting it before the public was begun. The process of enlightening the general public was slow and tedious, but eventually succeeded. In addition to the regular newspaper advertisement, pamphlets were attached to the monthly bills, explaining the economical use of electricity for cooking purposes. Since 80 per cent of the bills were paid at the office, the ranges were attractively displayed on the office floors. A model kitchen at an expense of $800, called the Edison kitchen, was built especially to demonstrate the electric range. An experienced cook was employed, and cooking demonstrations were carried on from 8 a. m. to 5 p. m. At these demonstrations bread, meat and pastries were cooked and put on display for the public's benefit. Sales have been induced by giving samples of cooking to the customers. By explaining the company's position in handling the electric range and by inducing the consumer to use more electricity, the confidence of the public has been won to the electric range. Thus, the general opinion of the public that electricity is an extravagant and high-price method of cooking has been overcome. This work was done contending with a 55-cent gas rate. But, in spite of this, the company has not been able to secure enough ranges to fulfill orders.

Mr. Deeds predicts that the electric range will be universally used in this locality within the next two years. He is now planning an extensive campaign as soon as a stock supply can be secured. This campaign will be more complete than any which has been previously conducted. An inquiry will be made by a house-to-house canvass as to what is being used. This will later be followed by personal letters.

Schenectady Company Offers to Light Guide Posts to City.

A movement having its inception in a generous offer made by the Schenectady (N. Y.) Illuminating Company will be pushed forward very shortly for the proper marking of the boundaries of the city on the three state roads leading into Schenectady. The Illuminating Company offered current to the city for five years to light pillars at these three places.

An arch is suggested for the entrance to the city over the Scotia bridge, with a similar design at other prominent locations.

Energy Rates to Be Reduced in Lexington.

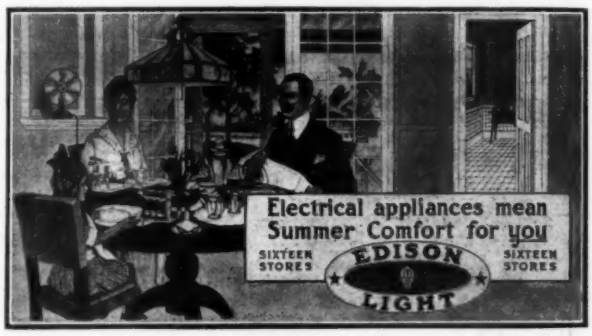
A reduction of practically 40 per cent in the charge for service has been agreed on by the city of Lexington, Ky., and the Lexington Utilities Company, in the franchise which the company is expected to operate under for 20 years after August 16. A maximum rate of 9 cents per kilowatt-hour was fixed for residences, 8.5 cents for commercial lighting, and 8 cents for power, all bills subject to a 10-per-cent reduction if paid within 10 days. The old rate was 15 cents for residential service.

San Diego Company to Extend Its Service.

Plans announced by the San Diego (Cal.) Consolidated Gas & Electric Company for the improvement of the service at Oceanside, Cal., where the local electric lighting plant and system was recently purchased, includes 24-hour service, reduced rates, and extension of the distribution system to serve at present unserved districts. Oceanside is a town of about 2,000 people, situated 14 miles north of Cardiff, which is the present terminus of the San Diego Company's lines. Construction of a connecting transmission system has been begun and will be completed August 1. A branch of the Oceanside system, which has served a considerable irrigation power load in the San Luis Rey Valley, will be improved and somewhat extended. One piece of new business on this line which has been secured since the San Diego company purchased the property is a 100-horsepower motor pumping installation for the South Coast Lands Company.

Display Card Breathes Summer Comfort.

A street-car advertising card, depicting the delights and comforts obtainable by the summer use of electrical cooking and other domestic appliances, has been issued by the Boston Edison Company, and is reproduced herewith. The softness of coloring and delicacy of touch, which the



Attractive Street-Car Display Card.

artist has used with excellent effect, gives the desired impression of coolness and freshness. The Boston Edison Company's superintendent of advertising, L. D. Gibbs, is an adept in the utilization of the laws of psychology in his publicity output which explains to a large degree the success which attends the company's advertising campaigns.

New Rate Schedule for Spokane.

A complete change in the present method of computing electrical rates to take effect after August 31, has been announced by H. L. Bleecker, vice-president of the Washington Water Power Company, of Spokane, Wash. The new rates will affect approximately 50 per cent of the light and power business of the company, and applies to accounts that do not fall under the residential rate scale, which began July 1. Mr. Bleecker states under the new schedule there will be from 25 to 50 per cent cut in the present commercial rate, which is based on kilowatt-hours consumed with no "maximum-demand charge." The minimum bill will remain $1 per month.

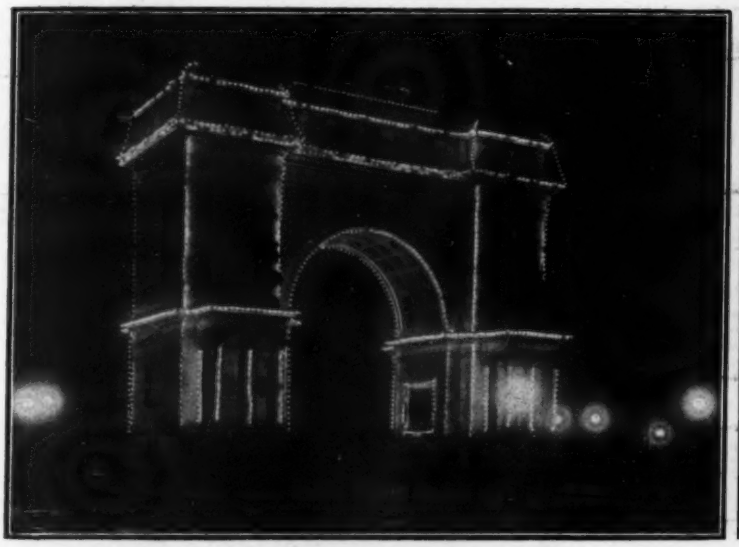
New Use for Disk Stove.

The new-business department of the Denver (Colo.) Gas & Electric Light Company has evolved a new use for an electric disk stove. At St. Luke's Hospital, in Denver, a great many vapor baths are given, and the nurses have been using a gas hot plate for generating the necessary steam. This has been very unsuccessful on account of fumes and other features, but an experiment proved that the disk stove was exactly what was needed.

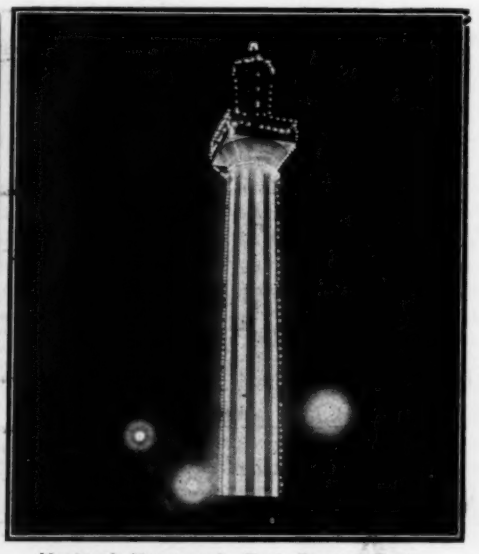
New York's Electrical Safe and Sane Fourth

Flood Lighting of Soldiers' and Sailors' Monument.

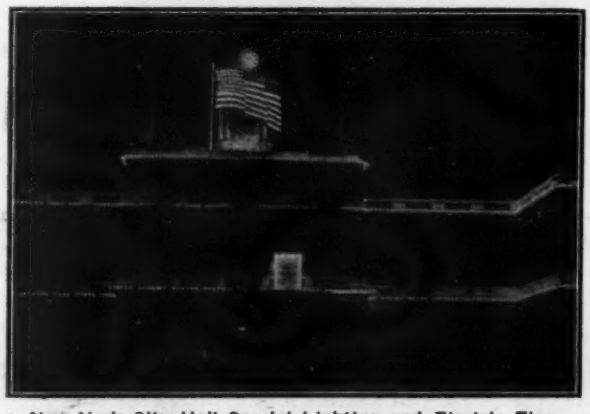
New York Edison Company's 42nd Street Building.



Soldiers' and Sailors' Arch, Prospect Park, Brooklyn.



Martyrs' Monument, Fort Greene Park.



New York City Hall Special Lighting and Electric Flag.

Electric Lantern Streamers on West 39th Street.

The above are a few examples of the safe and sane manner in which New York City celebrated Independence Day at 51 civic centers throughout the city. Numerous private illuminations also marked the day. Energy for illumination of the municipal buildings, monuments, bandstands, etc., was furnished free by the progressive central-station companies; in some cases the special wiring being also furnished by them. The photographs for these illustrations were kindly supplied by the New York Edison Company and the Brooklyn Edison Company.

POWER ENGINEERING

Problems Involving Motor Applications, Machine Characteristics, Power Sales Methods and Industrial Electric Heating

Louisville Campaign on Isolated Plants Meeting With Success.

In Louisville, Ky., where a few years ago isolated lighting plants were the rule rather than exception in office buildings, stores, apartment houses, etc., today there are only 11 plants serving such establishments. During the past six years more than 25 of these isolated building or block plants have been thrown out and replaced with central-station service, while there is almost no record of a new institution under the heading named having installed a plant of its own in the last several years. There are less than a dozen isolated plants now left and A. S. Witmer, sales engineer of the Louisville Gas & Electric Company, with the others of the sales force, have given themselves one year of concentrated campaigning to eliminate the few remaining plants that come under this heading.

There are still, of course, a quite considerable number of isolated power plants in manufacturing establishments, but it is to be noted that hardly a new one is going up unless steam requirements and waste for fuel practically dictates isolated service.

Out of 23 hotels in Louisville, only two have isolated electric plants; out of 20 important office buildings, only three have isolated plants, and these are in the secondary class of buildings; out of five large department stores, one alone has an isolated plant, while the retail establishments in all lines are nowhere using independent plants; not one of the four daily newspaper plants uses independent service and all of the printing and publishing houses, of which there are 50 or more using power, rely on central-station service.

Only two of approximately 40 important apartment houses continue to operate isolated plants and only three of 30 or more homes and hospitals along lines of the company operate isolated plants. This brings the count to 11 plants which have been marked for possible elimination within a year.

First Electric Steel Furnace in the South Very Successful.

The first unit of Old Dominion Iron & Nail Company's large electric steel plant near Richmond, Va., is being successfully operated and producing a very high grade of steel—the first electric steel to be produced in the South.

The machinery was especially designed in Stockholm, Sweden, and other units are being installed which, it is asserted, will make the plant the largest factory of its kind in the United States.

The product of the furnace is made from scrap steel which is plentiful in Richmond on account of the many iron and steel plants adjacent to the city and excellent railroad facilities for transporting the material.

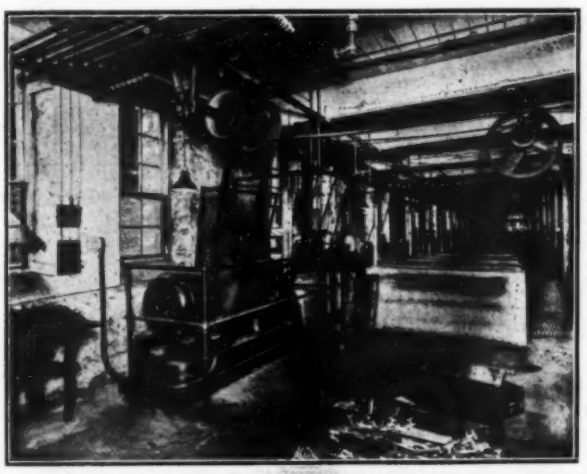
The Old Dominion Iron & Nail Company is controlled by Gould interests. Thomas S. Wheelwright, president of Virginia Railway & Power Company, is vice-president and general manager. The plant occupies 75 acres on an island in the James River.

ELECTRICITY IN TYPEWRITER MANUFACTURE.

Brief Description of a Modern Plant with Data on the Motor Equipment.

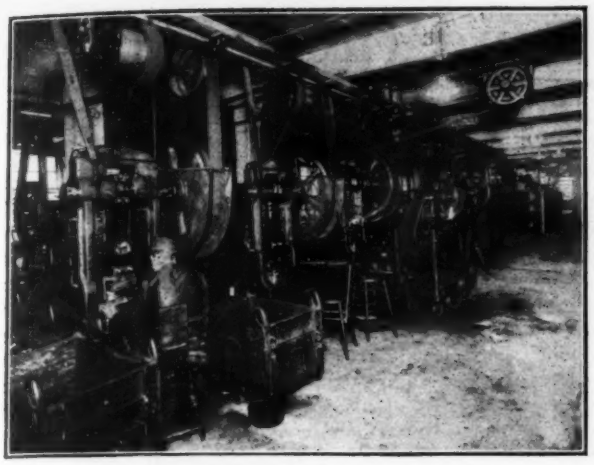
In this branch of manufacturing, electric drive and central-station service offers especial advantages. The nature of the work requires the highest precision and the duplication of hundreds of small parts in large quantities. Much of the work is performed by female employees and under such conditions the "safety first" feature is predominant. By the use of motor drive the various machines are so grouped that heavy line shafts and large belts are eliminated. Better lighting and greater cleanliness are possible, adding to the comfort of operatives, which is in itself an incentive to increased individual efforts. Owing to the fact that the machines used in the manufacture of typewriters are small, group drive is best adapted to the service, using squirrel-cage induction motors.

The Smith Premier Works of the Remington Typewriter Company, Syracuse, N. Y., is a good example of the application of electric drive to this class of work. There, several models of typewriters are manufactured, including the Smith Premier adding and subtracting typewriter, which adds and subtracts while the typist writes. Ball bearings are used in the carriage and the type bar, and wherever else in the machine such use makes for easy, quiet and efficient operation. This feature involves the use of special ball-making machines and special machines of many other kinds for automatically making various parts in large quantities. At the present time the Smith Premier works is manufacturing 100 typewriters daily.

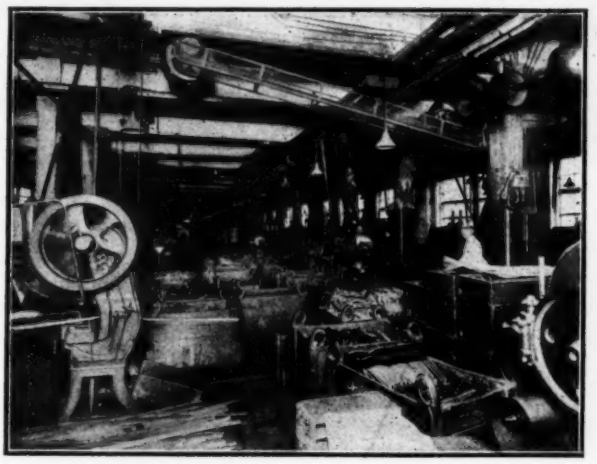


Motor-Generator Set and Plating Tanks in Electroplating Department of Remington Typewriter Company's Smith Premier Works.

Seven stories compose the building, inclusive of the basement, and electric drive is used on the first five floors. Service is supplied by the Syracuse Lighting Company from its 6,600-volt, three-phase, 60-cycle power system and



Group of Motor-Driven Punch Presses.



Motor-Driven Milling Machines, Drills and Punches.

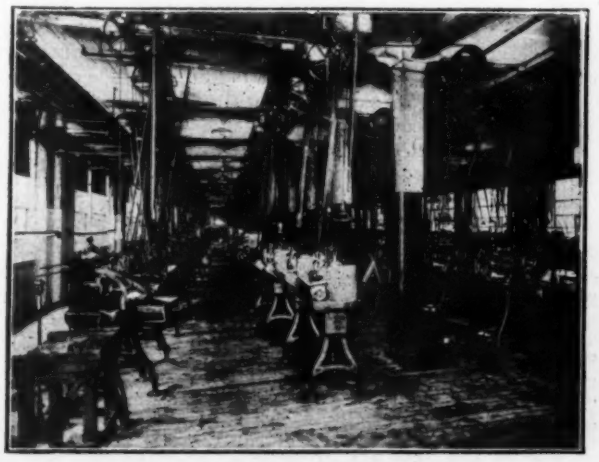
the voltage is reduced to 220 volts for the motor operation. The majority of the motors are of the squirrel-cage type. On the first or basement floor are located the ball department, nickel plating, small parts punch press, and the polishing departments. The second floor is devoted to milling machines and drill presses with the possible exception of some miscellaneous machines; the third floor is devoted to punch presses and screw machines; the fourth floor, tool room and wood shop; while the fifth floor is employed for special machines and assembling.

One of the most interesting departments is the ball department on the basement floor. Not only are the machines used of interest but also the compact arrangement of the machines for group drive. There are two 7.5-horsepower motors driving 20 ball grinders; a 7.5-horsepower motor driving a pump and five ball formers, and a 15-horsepower motor driving four lathes and a rough grinder. After the balls are formed and ground they are automatically sorted and graded by machines, after which they are subjected to microscopic examination to detect flaws. In the nickel-plating department there is a motor-generator set consisting of a 20-horsepower induction motor direct-coupled to a 2,500-ampere, 4 to 8-volt, double-commutator generator of the direct-current type, for supplying current to the nickel-plating tanks. There are numerous special machines throughout the plant which were designed and built by the Smith Premier engineers. These are employed for a variety of purposes in the production of small parts. The following list of motors and their applications will give an idea of the general arrangement of machines and the motors.

No.	Horse-power	Speed R. P. M.	Kind of Drive	Application
1	10	1200	Group	32 polishing jacks.
1	10	1200	Group	14 punch presses.
1	15	1200	Group	4 lathes, 2 rough grinders.
1	7.5	1200	Group	Pump, 5 ball grinders.
2	7.5	1200	Group	20 ball grinders.
1	2	1200	Group	2 ventilating fans.
1	20	700	Direct-connected	Direct-current generator.
1	10	1200	Group	30 milling machines.
1	15	1200	Group	42 milling machines, 10 drill presses.
1	15	1200	Group	23 milling machines, 7 drill presses.
1	10	1200	Group	19 small screw machines.
1	10	1200	Group	19 small screw machines.
1	10	1200	Group	15 small screw machines.
1	10	1200	Group	16 small screw machines.
1	10	1200	Group	20 small screw machines.
1	2	1200	Group	Group small machines.
1	20	1200	Group	11 punch presses, 36 drills, 19 special machines.
1	10	1200	Group	28 punch presses.
1	5	1200	Group	Group small lathes, drills and milling machines.
1	10	1200	Group	Group miscellaneous machines.
1	10	1200	Group	13 grinding machines.
1	10	1200	Group	10 woodworking machines.
1	15	1200	Group	Group special machines.

Western Company Closes Contracts for 5,000 Kilowatts During June.

New power contracts closed by the Western Power Company, San Francisco, Cal., during June amounted to 5,000 kilowatts. Among the largest individual contracts is one for 1,500 kilowatts secured from the Standard Oil Company of California. The power will be utilized at the Point Richmond refinery. The steam plant there will be shut down and the refinery run by electricity.



Groups of Motor-Driven Turret Lathes.

Press Room for Small Parts. Motor Drive.

The Power Salesman and the Engineer

An Interview With a Successful Central-Station Salesman Indicating the Importance of Considering the Isolated-Plant Engineer

"THE first thing I do when I go after new business," said the veteran power salesman of a well known electric company, "is to get a line on the engineer. If it is a new plant the situation is much the same as if the plant is to be installed in an existing institution. The engineer holds the key to the situation. This is my motto: The better the engineer, the easier it is to sell him central-station service. There are some exceptions, of course, but the rule is one that generally holds. In other cases almost invariably a special set of circumstances stands for power at a figure well below the market rate."

Discussing his proposition this salesman instanced several local jobs, explaining the reasons why the company failed to get contracts when such was the case, and the course of the negotiations in the other instances.

"There was the fish hatcheries plant," he said. "It was a very large installation and the government's bill is one of the nice ones on the company's books. That was easy. The government has good engineers. About all we had to do to get that contract was to give some figures on the reasonable cost of our service and cite figures as to the cost of production in the isolated plants in the city. We hardly needed an hour to close up on that job.

"Then there are those four new office buildings on Main Street, built in the last five years. Three of them were built by the same number of the leading architectural concerns in the country. Another case of good engineers. The fourth was built by a local architect, but his standing is about the same as that of the others. These were four instances where the best kind of engineering thought was given to the matters of light and power. If there had been any way by which we could have supplied these buildings with heat, we would have had the heating contract as well as the current contract.

"The two newest hotels on opposite sides of the same street—one has its isolated plant and the other has central-station service. The first was built by local architects and local engineers and the other by outsiders ranking high. The first one put in an isolated plant, a good one, too, but, in spite of the extensive heat and hot-water requirements here, the owners are continually negotiating with this company on the subject of us taking over their light and power plant. The problem of disposing of the costly equipment appears to be all that keeps the deal from going through.

"We now have six big department stores. Only one of them has an isolated plant left. The two new ones are owned by a mercantile company with a big chain of big stores. Bang-up architects and first-rank engineers designed them and they provided for central-station service from the outset. There is the new athletic club. It has an isolated plant which we could not head off and I understand that the board would like to find a good purchaser and change over to central-station service.

"Now I am not knocking isolated power plants where they are the right things for the purpose, although my interests and those of the representatives of the manufacturers are contrary. But I do make the assertion that where the central-station service is priced reasonably the best engineers will prefer it over service by means of an isolated plant. You can see that this is true in this town or in almost any other town where, after there has been an unduly high rate, an equitable rate goes in force. You invariably see the isolated plants discarded one after another. Good salesmanship helps to hasten this elimination process, but at the same time good salesmen cannot add two and two and get seven. Nothing but a good thing gets anywhere these days."

One of the curiosities among the architectural and engineering items under construction in the same city is the installation in a new office building of a costly isolated plant. The electrical fraternity is much interested. The salesman who was assigned to the job reported to the manager of sales of his company that he could not reach the engineer. He was employed in a construction capacity rather than in an advisory capacity and defended himself against the central-station man by saying that the owners had given him his orders. Yet they were building a switchboard at the outset, providing for supplanting their own service with that of the central-station whenever it should be desired. They still, however, were spending thousands of dollars on the equipment for the separate plant.

"It is not that the engineer from outside of town is personally any more or any less righteous than the engineer found at home that makes him any easier to deal with than the home man. The point is that when a builder employes an out-of-town engineer he is almost certain to get one who has attained a high place. In other words, he is getting a man who has made a reputation for superior skill and understanding. When he takes an engineer at home he is more likely to be getting a man who, while he will do what he honestly thinks is best, is without the experience which makes him equal professionally to the big gun from one of the big centers."

So this power salesman at the very outset makes inquiries as to whether there is a consulting engineer on the job at hand. If so he considers his battle half won. Instead of going to elaborate pains to get up a schedule of comparative costs of central-station and isolated-plant service, the salesman can get in touch with the representatives of the owners, make his proposition for service and then supply the data that the operator of an isolated plant will want. The data, in due course, will be placed before the eyes of the consulting engineer and in all probability, if the central-station proposition is reasonable, the contract will be signed for the central-station connections.

With the development of engineering agencies whose services are given to power users and light users the task of the central-station salesman will become less difficult, if the view of the salesman quoted is the right one. Better engineering advice is constantly being made more readily available to those who require it than ever before. When the individual salesman lines up a prospect but fails to convince him of the soundness of his contentions, he can often make use of this fact and suggest employment of expert, disinterested aid in solving the engineering problems. It might not work out as he thought it would, but if the proposition stated above is true, it would in most cases. Then the salesman could point to the concrete case in his negotiations with other prospects who are similarly situated.

"You can't, as a rule, get the builder of a business house or a factory to engage the services of a consulting engineer at your suggestion," the same salesman said further, "but it is worth trying. You put the idea in his head, at least, and by not suggesting any particular engineer you do not let him have any grounds for thinking that you are trying to take an advantage of him. Sometimes you can

pull a few strings. If you stand pretty well with a friend of his you can sometimes make speed by getting that friend to second your motion about the consulting engineer. Or, if there is anybody connected with your company who has influence over the prospect-owner, or who has a friend who has, that is worth making use of. The very fact that you are merely urging the advisibility of the best service relieves you of any suspicion of not being disinterested. If you are sure you have got the best proposition, all you need is the best engineer available. He will do the rest of the work."

Following up this line of discussion the salesman went on to give an instance or two. He spoke of an implement manufacturing concern which he had not been able to do anything with for several years, until it was purchased by outside interests and added to a chain of similar factories in different lines. Almost the first thing that the salesman did after the change was effected was to get his proposition before the representatives of the new company. His data were shortly before the chief engineer of the big company. Soon afterwards the salesman got his contract. Good engineering attention to the problem, he said, was what did the work.

Where the highest quality of engineering ability is not available is where the central-station power salesman has to do his hardest work. The best engineers, at one time, had a great deal to learn. That is the case with many of the engineers who right now hold the acceptance or the refusal of the contract the salesman is after in their hands. In other words, before the sales engineer can convince the plant engineer of the desirability of the service he has to sell, he must educate him. That is another way of saying that it pays to keep on trying to land the prospect, once he has been marked. Instead of presenting the proposition and getting the answer, then getting the negative answer from the prospect and then writing "finis" at the bottom of the page, the sales engineer should never consider the negotiations closed until he has his contract signed up. He does not "fail to land" the business after each attempt; he has merely given his pupil another lesson in electrical engineering.

Nor is it necessary to conclude that the work has gone for nothing if, after laboring with the prospect for a long time, the opposition lands the contract. For, if the premises on which the sales engineer has been basing his campaign are what they seem to be, the erstwhile prospect will sooner or later wish he had let himself be converted into a customer. He himself, or his employer, may never get on the books of the central station during the connection of this particular salesman with it, but the mere fact that here is a concern with an isolated plant which does not like it is a real, even if not an active, influence in favor of other business for the salesman.

Whatever the circumstances, there is no getting around the fact that the engineer in the case, at one time or another, will very likely have the deciding word to say as to the nature of the power provisions. If the salesman will keep that point in mind and, whatever else he does, prepare to deal with that engineer on the basis of efficient power, the chances are that he will be able to save himself a lot of hard work and time. If the engineer on the job is posted as he ought to be—and if he is a good engineer he will be—the details of the proposition will not have to be worked out as in cases where the engineer in the case is not up to the mark. In the latter case, the question becomes one of providing for a consulting engineer or of schooling the man in the saddle. In any event, the advice of the experienced salesman to get a line on the engineer early in the action is sound, and if well taken may prove the basis for securing many good contracts that could not be obtained as readily by other means.

Government Power Development for Fixation of Nitrogen.

The United States Congress has recently passed a bill authorizing the development of hydroelectric power to be used in plants for the electrical fixation of nitrogen, so as to provide a source of the nitrogen necessary in the manufacture of munitions of war and thus make the Government independent of the necessity for importing nitrates for this purpose. On account of the importance of this project, the chief provisions of the bill are given below.

The President is authorized to cause to be made such investigation as in his judgment is necessary to determine the best, cheapest, and most available means for the production of nitrates and other products for munitions of war and useful in the manufacture of fertilizers and other useful products by water power and any other power as in his judgment is the best and cheapest to use. He is also authorized to designate for the exclusive use of the United States, such sites upon any navigable or non-navigable rivers or upon the public lands, as in his opinion will be necessary for carrying out the purposes of the act. He is further authorized to construct, maintain, and operate, at or on any site or sites so designated, dams, locks, improvements to navigation, power houses and other plants and equipment or other means than water power as in his judgment is the best and cheapest, necessary or convenient for the generation of electrical or other power and for the production of nitrates or other products.

The products of such plants shall be used by the President for military and naval purposes to the extent that he may deem necessary, and any surplus which he shall determine is not required shall be sold and disposed of by him under such regulation as he may prescribe.

The sum of $20,000,000 is appropriated out of any moneys in the United States Treasury not otherwise appropriated, available until expended to enable the President to carry out the purposes provided for. The plant or plants provided for under this act shall be constructed and operated solely by the Government and not in conjunction with any other industry or enterprise carried on by private capital.

In order to raise the money appropriated by this act and necessary to carry its provisions into effect, the Secretary of the Treasury, upon request of the President, may issue and sell or use for such purpose or construction hereinabove authorized any of the bonds of the United States now available in the Treasury of the United States under the acts of August 5, 1909, February 4, 1910, and March 2, 1911, relating to the issue of bonds for the construction of the Panama Canal to a total amount not to exceed $20,000,000.

Another Woodworking Plant Buys Power.

The Southern Veneer Company, at Twenty-first and Standard Streets, Louisville, Ky., has contracted with the Louisville Gas & Electric Company for service on the basis of a 225-horsepower connected load, and the company will change over from steam to electric drive, a 160-horsepower Corliss engine being discarded. This was the last of the veneer mills in Louisville to come to central-station service, and the installation will be combined group and individual drive. The waste problem here is relieved by the fact that much of the waste is in the form of slabs for which there is a ready sale as fire wood, while the veneer dryer disposes of the small waste.

Electric Pumping for Boston Dry Dock.

A large dry dock at Boston, Mass., planned by the Board of Port Directors and to be constructed by its successors, the Waterways Commission, will be equipped with electrically driven pumping apparatus, to exhaust the contents of the dock. Plans and specifications are being formulated, and bids will be asked for by the Commission, whose office is at 15 Central Street, Boston, Mass.

ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

CO-OPERATION BETWEEN ELECTRICAL CONTRACTORS AND JOBBERS..

Principles Adopted by the Oregon Association of Electrical Contractors and Dealers.

At a meeting held a few months ago the Oregon Association of Electrical Contractors and Dealers adopted a revised constitution and by-laws, which contain features of much interest to similar organizations. The objects of the association are very progressive and have appropriately been set forth as follows:

Its objects are to promote the welfare of its members and to distribute among them the fullest information obtainable in regard to all matters affecting the business of the electrical contractor and dealer.

To encourage its members in establishing attractive retail stores where the consumer may obtain his requirements of electrical material.

To aid in bringing about a more friendly relation between the electrical contractors and dealers, and to promote home industry by co-operation with manufacturers and wholesalers, who maintain stocks and organizations in the territory of its members.

To assist in standardizing and marketing high-grade electrical merchandise of American manufacture and by encouraging the proper installation reduce the fire hazard by co-operating with the National Fire Protection Association, the Board of Fire Underwriters of the Pacific, and local municipal electrical inspection departments.

To improve the standard of specifications by co-operating with the American Institute of Electrical Engineers, American Institute of Architects and local chapters of same, Northwest Electric Light and Power Association, and municipal lighting and power plants and by closest co-operation assist them in solving the problems which will improve the service to the consumer.

To encourage the more general use of electrical appliances by encouraging its members to affiliate with and support the work of the Society for Electrical Development.

To encourage and support local electrical development societies.

The association has incorporated in its by-laws a declaration of principles and of work to be accomplished, which was drawn up by a joint committee of jobbers and contractors. It is entitled "Co-operation Between Electrical Contractors and Jobbers—What It Means to You," and is as follows:

It is a recognized fact that certain branches of the electrical industry are today in a very demoralized condition. As this is due largely to lack of proper co-operative effort on the part of the different branches of the industry, it is the belief of the committee that, with a proper organizaton whose primary interest is to educate its members to a greater responsibility, much good can be done in the way of properly serving the consumer and of creating a desire on his part to use electrical appliances and to adopt the idea, "Do it electrically," the slogan of the Society for Electrical Development.

As examples of what can be accomplished we only have to review the work of improvement clubs, societies, chambers of commerce and similar organizations throughout the country. Could individuals in the same period of time have brought about the reforms and changes in business methods that these associations have accomplished for their membership? The Panama-Pacific Exposition, opened in San Francisco in 1915, is an evidence of co-operative association team work.

The central stations, through their strong organization, the National Electric Light Association, have brought the lighting and power industry to a high degree of development and, while doing so, have reduced rates to the consumer—neither of which could possibly have been accomplished through individual effort.

Electrical engineers, through the American Institute of Electrical Engineers, have been better prepared for their work through fuller knowledge of the requirements to be met and of the means of fulfilling them. This institute is conducted purely for educational purposes and without individual profit to its members, except insofar as they improve themselves by participating in the work.

Electrical manufacturers and jobbers through co-operative work have done much toward educating themselves, and as a result have placed their business on a firmer, more economical and more satisfactory basis. It has been proved through this work that, notwithstanding the increased cost of living and the consequent increase in the cost of almost every known commodity, the cost of electrical appliances has been steadily reduced and the quality of the article steadily improved. The principal effort on the part of these industries has been toward educating their members to the necessity of efficiency in order that the various branches may operate their particular business at a minimum of expense.

Architects have the American Institute of Architects as their national association. We would hardly recognize as progressive an architect who is not a member of this institute. Some of his most valuable information is obtained through such membership and through his affiliation with other architects in association work.

While undoubtedly electrical products have made more rapid strides in the last ten years than any other industry, the building industry, generally, has kept apace with the times.

It is the belief of the committee, however, and it will be admitted by architects generally, that, while satisfactory progress has been made in the building industry, at least from an architectural standpoint, the electrical equipment in buildings of all classes has been steadily neglected, and it is common practice today, among many architects, to use electrical specifications which have been regarded by the electrical industry for a long time past as obsolete.

The occupant of any commercial type of building, hotel, apartment house, flat, bungalow, or private home generally realizes only too late that no provision has been made for the many electrical conveniences. Many attempts have been made on the part of electrical people to assist architects in the drawing of proper specifications, but they invariably receive no encouragement as certain architects really believe that they have forgotten more about proper electrical installations than all the electrical men in the country ever knew and for this one reason they are impossible to approach.

They make no distinction between the reputable and the irresponsible electrical contractor. Their one idea seems to be to let the electrical contract simply on price. The result is evident:

Original cost of installation	100 per cent
Extra before occupancy of building	25 per cent
Extra after building is complete	50 per cent

and the installation is still incomplete. An additional allowance, in the first place, would undoubtedly have provided a better installation with less cost to the owner.

Electrical contractors have their national and state associations which have done much to educate their members in the proper conduct of their business and through their local meetings and state conventions have made possible an exchange of ideas that has tended to elevate the standard of work.

Notwithstanding the great results that have been accomplished by the association, there are many electrical contractors who have failed to recognize the advantages to be gained by such association effort. This is evidenced by the present state of the electrical contracting business.

In the past, when a contractor has been approached and

the suggestion offered that he become a member of the association, he has immediately asked, "What am I to gain by joining it?" The answer to this question is that he gets out in proportion to what he puts in. Having put in nothing in the past, nothing is what he has gotten out.

It is the belief of the committee that an electrical contractor unattached is unable to keep apace with the progress of the industry and consequently is unable to properly serve his customers.

If he will become a member of the association and will give it his support, it would be impossible to estimate the benefits he will derive from it, as evidenced by the results of association work in other lines of endeavor, whether commercial or political.

As we have shown above that a competent architect should of necessity be a member of the American Institute of Architects or in some way affiliate with its local chapters, so it is clear that an electrical contractor should for the same reasons be a member of some association which represents his craft.

It is fully recognized that the economic and proper channel of distribution of electrical supplies is through the electrical supply jobber to the dealer and contractor, who, in turn, serves the consumer. By this method the dealer and contractor is enabled to have the advantage of a complete stock of electrical merchandise in the warehouse of the jobber which can be drawn on at any time, no matter whether it is one item or a hundred, and can be assured of prompt shipments and satisfactory service from every standpoint.

The jobber makes it his business to keep in close personal contact with the dealer and contractor in his territory, studies his wants and plans to serve his needs, no matter what they may be. Through frequent calls of his salesmen he is often enabled to give valuable information, keeping him advised of the new lines of standard goods on the market and furnishing technical data or giving such other information as may be useful from time to time.

He is frequently able to be of service by carrying his contractor or dealer, who has been tied up financially on account of delays in jobs over which he has had no control.

This kind of service cannot be had where the contractors and dealers do business at long range and with people who are not in close touch or sympathy with their conditions or problems.

The dealer and contractor is the natural channel for distributing various electrical devices to the consuming public. He carries the material in stock and displays it on his counters and in his show windows. The consumer is thus enabled to see the material which he is purchasing and knows that he is getting full value for his money. He can get promptly any information he needs or instructions in the use of the various electrical devices which is a service that could not be rendered satisfactorily by correspondence with some distant point.

The object of this joint committee is to promote the use of electrical appliances and to influence the public to adopt the idea, "Do it electrically."

The co-operation of the central station in each district is highly desirable and a closer relationship with the architect and those engaged in the industry must be maintained. In the past the industry has failed to provide suitable show rooms at which the consumer can obtain electrical appliances, therefore we will encourage the establishing of proper stores where material can be obtained at retail.

To accomplish this end, a campaign of education is about to be instituted. It provides for visits by the committee to all parts of the state, where public lectures will be given, supplemented by moving pictures, stereopticon views and working demonstrations of electrical appliances.

In order to gain the full confidence of the public in the industry we represent, the class of material furnished and the excellence of workmanship in its installation must be of the highest order. We should never recommend for sale an article in which we have not absolute confidence, and a full knowledge of the functions it will be called upon to perform.

We should not consider an installation as tending to promote the best interests of the industry, unless it has met with the unqualified conviction on the part of the contractor that it is of the highest class. An installation made by an electrical contractor simply because it will pass inspection is undoubtedly bad practice.

We recognize that, in our business, probably more than in any other, the public is woefully ignorant of the quality and merits of electrical devices. Whether or not they are satisfied depends upon how we serve them. We should recognize that the National Electric Code, while having accomplished a great good, does not to the fullest extent accomplish the desired results for the reason that it does not distinguish between standards of material.

We will advocate the grading of material by the National Fire Protection Association.

We recognize that local inspection bureaus are not responsible for installations in compliance with architects' specifications.

We will advocate the employment of one or more competent electrical engineers, whose duty it will be to furnish architects with certificates, certifying that work has been performed in accordance with the specifications embodied in the contract.

Work may be performed which in every respect meets the requirements not only of the National Fire Protection Association, but local state or municipal inspection bureaus, which is not a credit to the electrical industry. We are opposed to electrical contractors who, after executing a contract, endeavor to substitute material of lower grade. We advocate that the various electrical contractors' associations should assume the responsibility for seeing that their members perform work in accordance with specifications without attempting to evade contracts in any way.

We believe that with proper co-operation on the part of the architect and other allied interests, the various state associations of electrical contractors will ultimately be able to guarantee on behalf of their members the completion of any contract entered into.

We will ascertain the names of all societies of architects, times and places of meeting, and will endeavor to have representative electrical engineers as well as members of our joint committee appear before these associations to explain the necessity of not only the proper drawing of, but also the compliance with recognized modern specifications.

Caution should constantly be exercised to see that only those contractors are admitted to membership of an association whose character and honesty are unquestioned and who have an established reputation for square dealing.

Copies of the complete constitution and by-laws of the association and of this declaration of principles may be obtained by those interested on application to the secretary-treasurer of the association, J. W. Oberender, 502 Dekum Building, Portland, Ore.

Fireproofing Cables With Concrete.

The Edison Electric Illuminating Company of Brooklyn, N. Y., uses concrete to fireproof its lead-covered feeder cables in manholes. Before the concrete is placed on the cables, two coats of parafin, separated from each other by cheesecloth, are put on the sheaths. This prevents the concrete from having any injurious effect on the lead sheaths. In the accompanying illustration, *A* shows one of the cables after parafin and cheesecloth have been applied. A one-quarter-inch hemp rope is then wound around the cable spaced on one-half-inch centers to serve as a binder, over which a five-eighths-inch layer of concrete is placed. *B* shows one of the cables covered with rope and *C* shows two cables with the concrete complete. This method of fireproofing also prevents the sheaths from picking up stray electric currents. R. A. Paine, Jr.

Method of Protecting Lead-Covered Cables in Manholes.

Raising Standards of Electrical Construction

Special Features Connected With the Practical Operation of the New Municipal Electrical Inspection Department of Milwaukee, Particularly the Co-operation of Contractors With Inspectors

IN the last issue of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN there was an article on "Licensing of Electrical Contractors," in which it was shown that licensing is only one step in the effort to raise the standard of electrical construction and that when combined with capable inspection it forms a very effective means of eliminating inferior and hazardous work. A splendid example of the operation of both licensing and inspection is afforded in the city of Milwaukee, Wis. The system of licensing and inspection in that city has now been in force long enough to show its value. It possesses a number of distinctive features, among which is the friendly co-operation of the reputable contractors of the city with the city's inspection department. Of additional interest is also the excellent way in which the inspection work is being carried out by the co-operation of other city departments with the inspectors. An interesting summary of the situation in Milwaukee was given in a paper read by B. Berssenbrugge, chief electrical inspector of Milwaukee, before a recent meeting of electrical contractors of that city. On account of the valuable points contained therein, it is given quite completely in the following.

Need for Municipal Electrical Inspection.

Mr. Berssenbrugge first traced the numerous causes that led to the drafting of the National Electrical Code, the primary object of which was to minimize fire hazards due to electrical origin. Casualties due to defective wiring and catastrophes directly or indirectly due to defective wiring or lack of wiring later caused municipalities to investigate such cases, and resulted in the formation of rules regulating electrical wiring to prevent repetition of such calamities. These rules and regulations were generally left to be enforced by either the fire department, building inspection, or police departments and in some cases by the central station, except where municipal electrical inspection bureaus were established. The service interests also found it necessary to issue sets of rules to regulate the service and meter connections, and they refused to connect their service to installations found upon inspection to be hazardous.

Thus it seemed that with so many rules and regulations the electrical installations to which they applied should have been in as safe a condition as the rules in vogue could make them. It was found, however, that quite the opposite was true, and that many electrical installations were constructed without any regard to rules and most of them still are a hazard to life or property. The main causes for this kind of work being done were lack of inspection and lack of authority to enforce the rules.

The boards of fire underwriters were not in all cases notified by the contractor to inspect installations, except where it was called for in the specifications, and the result was that in many buildings the wiring had been concealed before the inspector could convince himself that changes had been made as ordered. In other instances, where the insurance inspector objected to the construction and threatened to raise the fire insurance rates, the owners were able to write insurance at the usual rate with competing companies without any change in the construction of the electrical installation. Even if the rate of insurance was raised, the hazard was not eliminated.

The rules regulating electrical installations issued by municipalities, except where municipal electrical inspection departments were established, generally applied to a few types of buildings, such as public buildings, theaters or places of assembly, and buildings in which inflammable gases existed, and in many cases the municipalities did not have the proper men to observe whether the rules were being followed in buildings to which they applied.

The public utility rules generally covered only the construction of the service and the meter connections and, at the time a customer applied for service, the utility inspectors were able to inspect only the wiring exposed to view. The unscrupulous contractor was not slow to detect this lack of inspection, and by using inferior or defective material and poor construction was able to either enlarge his profits, or to underbid the contractor who intended to construct the installation strictly according to the rules in vogue. Some persons mechanically inclined did not hesitate to install electric wiring without any regard to rules, and the one-day electrician saw a chance to make some extra money by doing some wiring during his spare time, the construction of the installation generally measuring up to his incompetence. The unscrupulous or incompetent contractors and the amateurs, with nearly each piece of work they performed, added to the existence of fire and life hazards and it became clear that in order to protect the public from these dangers it was necessary to have an electrical inspection department with the proper authority to enforce the rules and to compel everyone who installed electrical wiring or apparatus to notify that department of such fact.

Origin of Municipal Inspection in Milwaukee.

The natural place for such an inspection department would be under the city government. The Wisconsin Electrical Association took the first steps to bring about municipal electrical inspection in the city of Milwaukee by having laws passed to govern same through the Legislature. Through the efforts of electrical contractors and others interested, in conjunction with the Building Code Commission, ordinances were passed creating a Municipal Electrical Inspection Department as part of the Bureau of Buildings and Elevator Inspection. The ordinance under which this electrical inspection department worked was made a law February 16, 1914, and was known as the Electrical Ordinance.

It provided for the licensing of electrical contractors and a penalty to be imposed upon any one installing electrical wiring or apparatus in the city without a license. It also required the application for a permit by licensed contractors for any installation of electrical wiring. The covering up of concealed wiring was prohibited until approved of by the inspector and no one was allowed to connect service to any installation not approved of by the city inspection department. After a few cases where they had to uncover wiring which had been concealed before inspection, the lathers and others whose business it is to cover up wiring refused to do so until the inspector's approval tag was attached to the building, and the public utilities refused to connect up until the whole installation was approved of. This made it necessary for the contractor to take out a permit and to call for inspection in due time in order not to delay the progress of work on the building or the furnishing of energy to its occupants.

Early Operation of Electricel Ordinance.

While the 1914 electrical ordinance was a start in the right direction, it was far from complete in that it did not contain any rules governing the details of construction of electrical installations. This was soon recognized and a circular letter sent out to licensees informing them that the Inspection Department would use the rules and regulations of the National Electrical Code as a guide in addition to enforcing the rules of a number of city ordinances containing sections pertaining to electrical wiring. At the outset of the Municipal Inspection Department assurance was given by many of the contractors of their intention to co-operate with the department and they did so in every possible way. Many cases were reported either by contractors or the public utilities where wiring was installed without permit and these installations were properly turned down until covered by a permit of a licensed contractor and until upon inspection everything was found to be strictly up to the rules. Some of the incompetent contractors found that it was less costly to them to study the rules and apply them to their work rather than to continue their old ways of wiring without regard to rules, while others, who continued to take cutrate contracts and naturally had to skimp in their work to keep up, fell out of the running when they had to change their poor construction, or at present continue their operations outside of the city limits only. Again there were others who, before being compelled to submit their work to inspection were doing poor work, raised their standard of work such that at present they do first-class work and find that in doing so boost their reputation correspondingly.

However, there still were some contractors who when they could cheapen their construction did so, even if departing from the rules of the National Electrical Code. They took the stand that these rules were but adopted and not made law by having them passed by the City Council in the form of an ordinance and that the Inspection Department had no authority to enforce such adopted rules. It soon became evident that it was necessary to amend the Electrical Ordinance so as to include definite rules on details of construction.

Improved City Electrical Code.

A set of construction rules was then formulated and discussed at several conferences of the Electrical Inspection Department and members of committees of different electrical interests in the city. These rules, in addition to the larger part of the 1914 electrical ordinance, were passed by the City Council to take effect on June 7, 1915, and these rules are in force at present. The rules of the National Electrical Code were drawn up directly for protecting property from destruction by fire, but a municipality through its electrical inspection department must not only protect property, but also life from destruction due to application of electricity. This fact was considered in making up the 1915 City Electrical Code, and there were adopted as many rules of the National Electrical Code as thought necessary and to this were added rules necessary for the prevention of casualties. As the National Electrical Code was under reconstruction at this time the new rules and changes contemplated in the 1915 Code were anticipated and embodied in the City Electrical Ordinance and Code.

Routine of the Inspection Department.

At this particular time it may be well to give some explanation as to the routine work of the Inspection Department. Upon filing an application for a permit to do electrical work specifying the number of outlets, etc., the licensee receives a permit. A permit card is made out for this and filed as to location. Inspection call cards are furnished by the department to licensees and mailed by them when calling for inspection. The location of building, permit number and date the work is ready for inspection are filled out by the contractor, and these cards, after being stamped as to date and time when received in the office, are filed as to date the inspection is called for. At the proper time this card is produced and the corresponding permit card given to the inspector.

When inspecting the installation the inspector marks his observation on the back of the permit card and upon return to the office next morning a copy of this observation is sent in the form of a notice to the contractor through the Police Department and reaches him generally that same day. The police officer receives two copies of the notice; one copy is delivered to the licensee and the other copy is marked as to date of delivery, signed by the officer and returned to the Inspection Department. By this means of delivery the city saves postage and the Inspection Department obtains a record of delivery of the notice which is of importance where time limits are given for changes ordered.

If the installation is one to be concealed and found to be up to the standard, an approval tag is attached to the building allowing concealment. If changes have to be made, the contractor is expected to call for reinspection by an inspection call card. If the whole installation is approved at final inspection, a certificate is made out allowing service or meter, which certificates are collected by the public utilities' representatives. If the installation is in such a condition that minor changes have to be made, but withholding of service is not necessary, the contractor is given a certain time to make the changes, and in this case the inspector follows up the job by filling out his own inspection call card for the date at which the time given for making the changes expires. The above applies to installations in new buildings.

In wiring of old houses, especially those occupied at the time of wiring, it is essential to give speedy service to accommodate the tenants and a different method from that above described is followed. The contractors have been advised to have all wiring to be concealed finished at the first inspection, so that, if found up to the rules, the baseboards and floors may be put back in place, the switches left out of the boxes, and the service wires in place up to the cutout cabinet. If approved, the inspector will notify the inspection department by telephone that the installation is ready for service; this fact is recorded and the public utility company informed. The contractor then installs the switches and plates and finishes the wiring in the basement, giving the public utility company ample time to connect service wires to the building. When the service wires are attached to the building, the fixture man installs the fixtures and calls for inspection on the day he hangs the fixtures. If in the morning of that day the inspector receives the permit card for the wiring and the fixtures on such an installation, he makes out a meter certificate and the public utility company is notified at once by telephone. Usually the meter will be installed that same day and the occupants in this way are not inconvenienced by lack of lighting. If the inspector finds the installation not up to the rules, he countermands the meter order, if necessary, or notifies the contractor of the nature of the changes and follows up the job as previously explained. Permit cards of completed installations are filed under "completed installations."

The inspectors are in the office from eight o'clock to approximately ten o'clock in the morning, during which time they write reports and give information to contractors as to installations in their respective districts. Any belated calls are given to them by telephone when they call the office for meter connections.

Co-operation of Fire Department.

The Fire Department reports many cases of defective wiring which are promptly inspected and ordered to be brought into

safe condition. It is generally a difficult task to convince the owner of a building that an installation or a part of it is dangerous. He cannot understand that an installation in use for 10 to 20 years without giving any cause for serious trouble cannot be left for another 20 years. However, they forget that, especially in large office buildings where tenants come and go, changes have been made frequently and the initial installation replaced by a network of wires strung in a haphazard manner; sometimes temporary work intended to be replaced by permanent work is left in for years until the inspector calls attention to its existence. If the owners are approached in the right manner and the defects pointed out to them which are existing in the installation and a few cases are cited where such defects caused trouble to occur, they generally see the point and have the defects remedied. In connection with this the idea of "Safety First" is found to be a great help.

The Inspection Department has little difficulty in enforcing the rules. As stated before, most of the contractors co-operate with the department and have given their men instructions to follow the inspector's orders and, if they consider any changes as ordered by the inspector unnecessary, to report them instead of arguing with the inspector. The contractor sometimes believes the inspector to be in error, but very often finds upon consulting the inspector that the man on the job misstated the facts or the inspector is able to convince him of the existence of rules of which he or his men were ignorant. Most of the violations of the rules in new installations are due to neglect or carelessness. The use of improper material is usually excused by the statement that the proper material was not provided, while poor workmanship is generally due to the little time allowance or lack of supervision. It is the temporary wiring which needs careful inspection, because being temporary no pains or time are taken to make it a very substantial piece of construction. Live switches are left unprotected and are insecurely fastened, fuses not inclosed, joints not soldered or taped, and conductors not separated from metal piping or subjected to mechanical injury, wires not connected to cutouts in existing cabinets and doors left open, or the wires connected to the wrong side of switches or cutouts, thus providing no automatic protection or means of cutting off the circuit.

Co-Operation of Contractors With Inspectors.

There are instances of where differences of opinion have arisen between the electrician or contractor and the inspectors. The decision of the inspector in all cases is based upon the rules of the City Electrical Code, which it is his duty to enforce. Although some rules may seem unnecessary to the electrician or contractor or even to the inspector himself, he has no choice in his decision if the point at issue is definitely covered by a rule. The arguing of such rules generally brings about a fracas between the electrician or the contractor and the inspector, and the result of this is generally a sarcastic criticism of the inspector's ability by the electrician or contractor, and a loss of respect for the inspector. As to the rules themselves, they are city laws, and arguments for or against them are of no avail except at the proper time when up for amendment. You therefore see the uselessness of arguments on rules and you contractors ought to uphold, not your men, but the inspectors in such cases. You contractors agree to install the work according to the city rules and regulations, which are definitely specified, and if the inspectors were allowed to diverge from these rules at will the benefit to you of an inspection department would be wiped out. In cases where the conditions are not covered by rules the decision of the inspector is final, as his judgment is based upon experience of his own and others.

Many times the man on the job asks the inspector for advice as to how to remedy a violation of the rules, which advice is cheerfully given. That this violation exists when the inspector arrives at the job and the man's ignorance of the proper construction shows lack of supervision. If the foreman or superintendent checks the work previous to the arrival of the inspector, he can point out to the man the violation and its proper remedy, and then can have the installation up to rules when ready for the inspector, thereby saving time for the inspector and saving time and money for his employer.

As to the rumors and complaints received by the Inspection Department that owners of buildings were notified of the existance of defects in installations under construction, be informed that it has been in the past, and is at present, the policy of the department to deal only and directly with the licensee or his employee and that any information as to defects given directly to the owners of a building has its source elsewhere than in the Municipal Electrical Inspection Department, with the exception of where an old installation has been condemned. No doubt when your Association took the first step to obtain a municipal electrical inspection bureau in this city, the motive was purely selfish, namely that of protecting your members from unfair competition by having standard rules and regulations governing the construction of electrical installations. However, in doing so the individual and the community as a whole also benefited by the result of your activities in that the enforcement of same eliminated fire and life hazards.

Among the Contractors.

The Flack Electric Company has opened an electric shop at Huntington Beach, Cal. Claude W. Flack is proprietor.

F. A. Bauman, of Portland, Ore., on a bid of $27,895 has been awarded the contract by the city council for the installation of electric wiring in the Municipal Auditorium.

H. W. Scott, Astoria,Ore., ona bid of $2,183, has been awarded the contract by the Port of Astoria for the installation of light and power wires in the grain elevator under construction there.

The Cox Electric Company has opened new sales rooms at 173 Galena Street, Freeport, Ill. The new concern will carry a full line of electrical supplies and is equipped to take care of all kinds of electrical work.

The Precision Electric Company is a new company recently organized in Kansas City, Mo., by J. H. Dovell and J. H. Morgan, formerly employed by electrical firms in Kansas City, to do electrical repair work specializing on motors. A shop has been opened at 1511 Main Street.

Equipment for the new bank, store and office building which the German-American Realty Company is constructing in New Albany, Ind., will include an isolated electric plant, to cost about $15,000, although the installation will be arranged so that central-station service may be supplied as desired. The Fairbanks-Morse Company has sold to the builder one 75-horsepower, oil engine, semi-Diesel type, direct connected to a 50-kilowatt, 220-volt, three-phase generator, for power, and two 25-horsepower oil engines, of similar type, direct connected to a 40-kilowatt, 220-volt generator for lights. The Harry I. Wood Company, Louisville, Ky., has the contract for the installation, at approximately $3,600, and will build a five-panel switchboard, two generator panels, one for central-station light, one for central-station power, and one meter panel. In addition the company will install the telephone conduits. It will be a conduit job throughout and the store rooms on the ground floor will be wired so that the occupants may buy service from either the isolated plant or the central-station company. The Harry I. Wood Company has begun on its contract for installing service and connecting up the two electric enameling ovens at the Ford Motor Company plant in Louisville. These ovens, the first in the section, call for 225 kilowatts each, 220 volts, three phase, each leg of the main feeders consisting of two 1,000,000 circular-mil cables. The Wood company will shortly begin on a contract for wiring and power in a six-story bank building at Clarksdale, Miss., a $3,000 job. Central-station service will be used.

DOLLAR WIRING KINKS

Every reader is invited to contribute to this page. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Fishing BX Cable.

While wiring a house with BX cable recently we were greatly pushed for time, as the job had to be completed very rapidly. There were several vertical runs, such as from the attic to the cellar, in which we found it to be a great time saving to put a piece of three-fourths-inch pipe over the lower end of the BX. This was used to hold it

Pipe Weight for Fishing BX.

plumb and keep it from coiling. By this means it was possible to drop the cable down from the attic through the walls without first using fish wires, and as the same scheme was used in running several lengths of BX, a material saving in time resulted. Charles Stadtmuller.

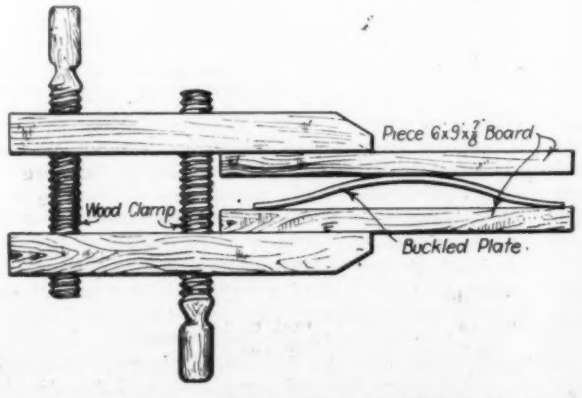
Threading Brass Tubing for Fixtures.

When threading brass tubing for fixtures, it is always highly desirable to do so without scratching. For three-eighths-inch tubing, I cut a three-eighths-inch iron coupling into two parts lengthwise and fill both sections with plaster of paris. I place the tube between these two sections and the whole in a vise. The plaster of paris serves to grip the tube quite firmly and yet without bruising it, so that the tube can be threaded without a scratch.

J. B. Josephson.

Straightening Buckled Storage-Battery Plates.

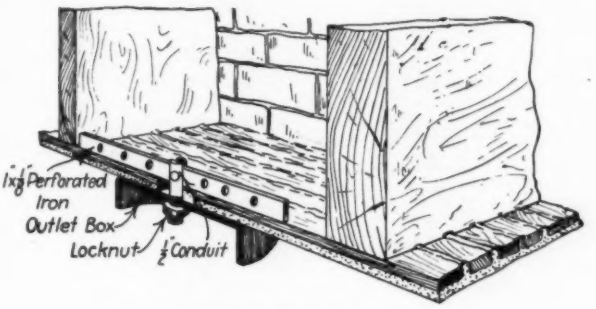
At a recent school celebration a considerable number of miniature decorative lamps were connected to a storage battery that usually was employed for supplying current to the bell system. The load on the battery was so much beyond its rated capacity that it caused the plates to buckle. In trying to fix up the battery I tried first to straighten the plates in a bench vise. This was somewhat unhandy and therefore I tried using a wood clamp as shown in the sketch. By using two boards somewhat larger than the area of the plate, I found that this worked out very satisfactorily. In work of this kind care must be taken that the plates do not come in contact with iron, brass or other metal except lead. Therefore the use of the wood clamp had an additional advantage. M. J. Moriarty.



Wood Clamp Used for Straightening Battery Plates.

Simple Fixture Support.

A simple fixture hanger is made of an eight-inch strip of one-inch by one-eighth-inch perforated iron. A piece of one-half-inch conduit about two inches long is threaded on one end far enough to allow a locknut to hold the outlet box. The conduit is then slotted about an inch with a quarter-inch hole bored through it. The perforated iron is



Simple Fixture Hanger.

placed in the slot and a stove bolt is put into the hole, holding the perforated iron in place.

When installing this hanger it is pushed through the hole in the ceiling and placed on edge across the laths. The outlet box is then secured to the short piece of conduit by the locknut. This makes a strong and easily installed device. E. Kemp.

Home-Made Indirect Lamp for Sick Room.

I was called upon some time ago to reduce the glare from the lamp in a sick room where the direct light from even a 15-watt lamp was found to be objectionable. I solved the problem by making a simple form of indirect fixture, which is shown in the accompany sketch. I inverted an ordinary green cardboard lamp shade and inserted in its bottom a current-tap socket with the side tap arranged in series. The boss of the tap was brought to the inside of the shade through a notched opening that was filed in the brass clip at the narrow end of the shade. A pendent switch was used, as shown, and the feed wires were brought down through the links of one of the chains and inside the shade to the side outlet of the current tap. A 25-watt lamp was used with this arrangement and gave very pleasant and sufficient light to permit the patient to read easily without being annoyed by the glare from the lamp. John Shortt.

Home-Made Indirect Fixture.

QUESTIONS AND ANSWERS

All readers are invited to submit questions and answers to this department. Anonymous communications will not be considered. Questions should relate to electrical matters of any kind. Answers contributed by readers should be submitted preferably within eight days of the date of publication of the question and should be limited, if possible, to 300 words. Payment will be made for all answers published.

Questions.

No. 353.—Motor Wiring in Forge Shop.—In a large forge shop there are to be installed numerous 440-volt, 25-cycle, three-phase motors for driving drop hammers, upsetters, shears and trimming presses, the equipment comprising the following motors: one each of 2, 3, 10, 35 and 75 horsepower, two of 50 horsepower, three of 25 horsepower, and four of 20 horsepower. (a) What is the best type of motor and starting equipment to use in this case? (b) What size wire should be used for the main line? (c) Which would be best, a main line run through the center of the shop with outlet boxes for branch circuits to the motors, or a distributing panel with an individual branch to each motor?—R. B., Jackson, Mich.

No. 354.—Demagnetizing Tool Steel.—Please let me know through the Questions and Answers Department how I can demagnetize pieces of tool steel that have become magnetized while working them in a magnetic chuck.—H. J. G., New York City.

No. 355.—Special Lighting Districts.—In what states, if any, is it possible to form lighting districts for the special purpose of providing more liberal or more ornamental street lighting by special assessment of all the property owners along the streets so lighted? What procedure is followed in organizing such a district? How does the plan work out in districts already established?—S. G., Yonkers, N. Y.

No. 356.—Mercury Rectifiers on Single-Phase-Direct-Current Locomotives.—Some time ago I read of a locomotive that was being experimented with to show the practicability of operating on a single-phase trolley line, the current being rectified for the motors through mercury-arc rectifiers carried on the locomotive. What was the result of these trials? Has this system been put into practical use?—H. S. J., St. Louis, Mo.

Answers.

No. 350.—Power Supply for Traveling Crane.—In the case of traveling cranes where either direct current or alternating can be purchased, which kind of power supply would be better adapted for the purpose?—C. J. E., Toledo, O.

The factors deciding the most suitable supply for an industrial application are: first cost, safety and convenience of operation, maintenance, and energy consumption. While the latter two items will not vary essentially whatever system is used, the first two will be essentially influenced by the choice of system. The first costs of the electric crane equipment include trolleys and trolley wire, insulation and suspension thereof, controllers, limit switches, brake-release solenoids and motors. As no particulars are stated regarding voltage available and frequency, we will assume that both direct-current and alternating-current supply are about 500 volts and the frequency of the latter 60 cycles, as usual. A difference in the voltage will be without much influence on the amount of copper required for trolley wire.

Single-phase current need not be considered, as the equipment is practically the same as for direct current (all series motors) with additional complications in motors and control apparatus making the system without question inferior to the direct-current system.

For the polyphase system the three-phase system is superior to the two-phase and a lower frequency superior to a higher, as the motors for crane service are always required of moderate speed, which with a higher frequency means more poles on the motor, more expense, less efficiency and lower power-factor. The advantages of 25 cycles over 60 cycles would, however, not be sufficient to warrant installing a frequency changer even for a number of cranes. But the advantages of direct current over three-phase supply, even at 25 cycles, are so significant, that for installation with a great number of cranes rotary converters for the conversion of the supply have frequently been installed, though the author knows of many cases in large works where 25-cycle crane equipment has been in use for years. To understand the difference one must consider the following.

Three-phase current requires theoretically less copper for trolley wire, but for mechanical reasons the size of trolley wire is in nearly all cases alike, making the outlay for three-phase supply (three wires against two for direct current) 50 per cent higher for trolley wires. For the same reason controllers and limit switches having to be three-pole instead of two-pole, are somewhat more expensive. In motors some advantages are claimed for the three-phase induction motor owing to the absence of a commutator, but since slip-ring motors have to be used preferably, the costs of both direct-current and alternating-current motors are very nearly alike, while direct-current brake solenoids are considerably cheaper than alternating-current solenoids of the same lifting power.

Even if the first costs, however, were the same for alternating current and direct current, the superiority of the direct-current crane equipment from the operating point of view would be sufficient to decide in its favor. The direct-current series motor is the ideal crane motor, as its torque approximately increases with the square of the current, while with the three-phase induction motor it is only approximately directly proportional to the current taken, and even less in starting. As the direct-current motor can act as a generator it can be used for rheostatic braking, while the induction motor has only this regenerating feature when running at above synchronous speed, which cannot be made use of without considerable complications over a very limited range of service. Controllers of the direct-current type, having magnetic blowouts and being air-cooled and therefore small in size even for large motors, can be operated by hand, while large alternating-current controllers have to be oil-filled and are difficult to handle. The direct-current controller is easily adapted and specialized for any particular service, such as hoisting, luffing, slewing, traveling with the greatest amount of safety against careless handling, while the alternating-current controller is really restricted to only one type, the resistance type.

While maintenance costs, as mentioned above, will not vary much, the small air gaps of alternating-current motors may prove irksome in dusty places, such as foundries and steelworks, and while energy consumption will be, if there is any difference at all, in favor of the direct-current supply, the load of alternating-current cranes will play havoc with the voltage regulation of a supply, unless the power station is exceedingly large in comparison to the crane load.

The above will suffice to show that where the choice is free, direct-current supply is preferable for crane service even if the price for direct-current energy is slightly higher. How far the advantage in favor of direct current is to justify its preference depends on conditions of service and locality.—J. J. W., Pittsburgh, Pa.

No. 351.—Annunciator Trouble.—I have some trouble with an automatic set-back annunciator system in a fine residence. It has a ground, but I do not want to take up any floors or tear into walls to find it. Could someone suggest a simple way to locate this ground and some way to overcome the trouble? There are steam pipes and gas pipes in the house.—R. L. G., Reynolda, N. C.

Separate all leads at the annunciator and open all alarm contacts. Test between pipe nearest to annunciator and each individual wire of the annunciator. Use a magneto or a battery in series with a telephone receiver. If a telephone receiver is used and the annunciator lines are quite long, or bunched, or if a cable is used, it will be advisable to insert an inductance in series with the receiver and battery. The primary or secondary of an ordinary telephone inductoin coil will answer the purpose. When the grounded line is located

it will be necessary to either fish in a new lead in place of it or to tear up the floors to locate and remove the existing ground. The exact location of the ground cannot be found without a knowledge of the exact dimensional location of the wire, its size, length, and accessibility of both ends; this further requires the use of expensive apparatus in the hands of an experienced operator.—H. E. W., Chicago, Ill.

I had similar trouble on a six-point annunciator system, but it was not of the automatic set-back kind. Batteries would run down in two days. I tested each wire by taking a lamp in series with a separate battery, grounding one side to a water pipe and touching the other side to each wire in turn. I found each of the wires on test would permit the lamp to light up, showing the entire system grounded. The wires, in fact, were covered with plaster and the brick walls were quite damp. It was not practical to tear out the old wire, which was cotton-covered and paraffined, but the lime had apparently eaten away most of the paraffin. I rewired completely with No. 16 rubber-covered wire, such as used for inside telephone installations. The wire was run along the top of baseboards and in corners. The new system has been in use six years without giving any more trouble, except to replace batteries about every two years that were worn out due to regular service.—G. J. G., Omaha, Neb.

No. 352.—Electrogavanizing Equipment.—What apparatus is required for an electrogalvanizing plant? Briefly, what are the various treatments to which the material is subjected?—F. W. S., Chicago, Ill.

Material that has been galvanized electrically, or electrogalvanized, has passed through three separate and distinct treatments, which may, for convenience, be divided as follows: (1) cleaning, freeing the material of oxides, grease, dirt, scale, etc.; (2) washing, and (3) electrogalvanizing. The electrogalvanizing plant likewise is usually divided into two sections or departments, one for cleaning and washing, the other for the actual galvanizing. The apparatus contained in the cleaning department would consist of suitable tanks for the sulphuric or hydrofluoric acid pickle, the hot potash, for electrocleaning, for washing and scrubbing, and possibly sand-blasting apparatus and tumblers. In the electrogalvanizing department would be the necessary dryers and rinsing devices, electrolyte tank, low-voltage heavy-current generator and motor for driving it, control apparatus for the above, copper busbars, and hot-water tank. Space prevents more than merely mentioning the various pieces of apparatus and the manner in which they are used, but the cleaning department should be located with respect to the galvanizing department so that the incoming material passes through the cleaning, then the galvanizing into the shipping department, and in this way requires a minimum of handling, floor space, etc.

The method used for cleaning the various pieces of metal differs with the shape, strength, size and physical characteristics, the commoner routine being to first pickle with acid, then tumble and sand blast. The washing is done by suspending the pieces in running water, and sometimes scrubbing them at the same time. The plating or galvanizing is accomplished by suspending the pieces in the electrolyte, the material being connected to the negative side of the heavy-current generator or cathode while the positive side of the generator or anode is connected to a piece of zinc. The pieces to be galvanized and the anode are both submerged in the electrolyte, of course. The zinc constituting the anode plays a very important part, and its purity determines very largely the quality of work. Cast zinc is the best adapted to the purpose, either elliptical, round or flat, because the structure is more open and crystalline than is plate zinc, and thus distintegrates more easily during electrolysis. In proportioning the size of the anode or zinc it should be remembered that its surface should be about one-third greater than that of the cathode surface.

The two important factors in electrogalvanizing that often receive less attention than they deserve are the cleaning and the use of the proper electrolyte. Surfaces must be clean. Cold-rolled and malleable iron is easily treated, requiring mild pickling. Hot-rolled iron must be pickled more thoroughly on account of being usually covered with hard scale. Cast iron is generally the most troublesome to treat because of the sand that is often burnt into the metal during casting, and because of its porosity. Hydrofluoric acid is often used to good advantage for removing sand. Where the pieces consist of a large number of small pieces of metal, sand blasting and tumbling are usually resorted to, the tumbling really consisting of placing the pieces in a cylinder which revolves and contains also a num- of pieces of metal for producing friction with the pieces to be cleaned. If the pieces being tumbled are greasy, sawdust is often placed in the tumbler, as it absorbs the grease. For the larger castings hot caustic soda is generally used to remove grease and oil.

The choice of electrolyte is of extreme importance. A large part of the unsatisfactory work turned out by the electrolytic process in the past, which has unfortunately brought the process into bad repute in some places, has been due to the use of improper electrolyte for the work on hand, or else to failure to maintain it in proper working condition. In case of failure, the pickling or cleaning is usually claimed to be at fault. Sometimes it is, but it may also be the electrolyte.

The electrolyte should be one that will give high electrical conductivity, because the energy cost depends upon voltage drop as well as current. Moreover, the thickness of the zinc coating and the time required to apply it both depend upon conductivity of the electrolyte. In choosing an electrolyte one should be taken that will decompose and deposit zinc with the smallest liberation of hydrogen, otherwise the zinc coating will be porous and of a granular or spongy nature. Certain chemicals are frequently added to the electrolyte to increase its conductivity, and therewith lower the cost of galvanizing and shortening the time required to do it; of these the more commonly used are sulphates of sodium and aluminum, chloride of ammonium. In addition to the above a number of organic and inorganic compounds are often added to the electrolyte to increase its density, their purpose being to act as colloids. Some of the best agents for this purpose are glue, gum tragacanth, dextrine, gelatine and alum.

To the writer's knowledge there are twenty different formulas in use for electrolytes for various classes of work. An electrolyte that is used largely for galvanizing band wires, iron sheets and wires, and mesh and similar articles, in what is known as the open still tank, is composed of zinc sulphate 400, sulphate of sodium 40, sulphate of aluminum 20, and boric acid 6, all expressed in pounds, to which is added water to make 200 gallons. The addition of one quart of hydrochloric acid to the above is thought to improve it. For the above electrolyte the current should be about 20 amperes per square foot, with a corresponding voltage of about 3 volts, with the application of from 30 to 40 minutes to obtain a white smooth coating.

For open tank work, a lower voltage is generally used, about 3 volts and a current of from 12 to 15 amperes per square foot of work surface. For this purpose a popular electrolyte is composed of 150 zinc, 75 of chloride of ammonia, 10 of grape sugar, all expressed in pounds, to which is added enough water to make 100 gallons. For mechanical apparatus higher amperage and voltages are employed. The choice of electrolyte depends upon the class of work being done, and this is a matter of experience in a trade full of tricks and short-cut methods known only to those skilled in the art.

Generators for electrogalvanizing are now available in capacities up to 10,000 amperes, being capable of depositing 1,000 square feet of metal at one time, or 16,000 square feet per ten-hour day at current densities of 10 amperes per square foot for thirty minutes. The generator should be placed as close to the galvanizing tank as feasible to save investment in copper and the voltage drop. The voltage of the machine depends upon the class of work to be done and the location of the generator. Low voltage at the tank gives a softer and tougher deposit of zinc, and a low voltage is absolutely necessary for a heavy deposit. Two to six volts appear to cover the majority of cases.—K. R., Chicago, Ill.

BOOK REVIEWS

"Electrical Engineering: First Course." By Ernst J. Berg and W. L. Upson. New York: McGraw-Hill Book Company, Incorporated. Cloth, 416 pages (5¾x9 inches), 296 illustrations. Supplied by Electrical Review Publishing Company, Inc. for $4.00.

Although there is quite a distinct difference between the service requirements of direct and alternating-current machinery, nevertheless, the physical principles of design and operation are practically identical. If an author approaches the subject of electrical machinery from the viewpoint of physical principles, the usual result is a book in which the essential identity of direct and alternating-current principles is emphasized, or at best the two are developed simultaneously, the author merely showing that under one set of conditions, certain phenomena are manifest and under another set of conditions, these same phenomena are of less importance, or only transient.

"The First Course in Electrical Engineering" by Berg and Upson emphasizes the physical principles underlying design and operation and in this respect it is an exceptional book. In addition to the fundamental principles of direct and alternating currents usually treated in a first course in electrical engineering, there is considerable material not commonly found nor adequately treated. Thus, the influence of different physical qualities upon the characteristics of direct-current generators are exemplified by the solution in detail of concrete design problems. The significance and importance of the different electrical constants are thus presented in an intelligible manner. Actual design data are used extensively for both the development of the principles and illustrations. Although the reviewer believes a more logical classification could have been employed and the number of chapters materially reduced, the material included is treated in a fresh and original manner and some of the chapters are worthy of special mention. To this class belong the chapters on Hunting, Short-Circuit of Alternators, Induction Motors, and Rotary or Synchronous Converters.

In the preface, the authors confess to having recorded their objections to the use of a prescribed text. Those who do not agree with them will be glad that the authors' objections have not been influential enough to prevent their preparation of this text. While some of the authors' definitions and statements are subject to criticism, electrical engineering literature has been enriched by the publication of this work, and the advent of the second volume will be awaited with favorable anticipations.

C. M. Jansky.

"The Electrical Contractor." By Louis W. Moxey, Jr. New York: McGraw-Hill Book Company, Incorporated. Cloth, 86 pages (5¾x9 inches), 15 illustrations. Supplied by Electrical Review Publishing Company, Inc. for $1.50.

The consideration which is being given by publishers to the problems of the electrical contractor is well indicated by the number of books in his interest which have recently been published. This latest addition to the list has a title which is rather indefinite. The first four chapters are devoted to the business side of the contractor's work, and explain the methods used by the Keller-Pike Company for cost-keeping, etc. The reality of overhead expense and the necessity for considering it are fully brought out. The five pages devoted to estimating do not go into sufficient detail to be of much value. Numerous cost figures are given and serve to illustrate the author's method, but the actual amounts will be of little value in the present disturbed times and especially in other localities where other wage scales are in effect. Two chapters are devoted to calculating wire sizes. A chapter on illumination should be helpful to contractors confronted with the problems of choosing proper installations of lamps and reflectors, although the treatment here, as elsewhere, is rather brief. The final chapter presents some useful data not generally available.

The neglect by many contractors of business methods suited to their work makes any discussion of this subject most timely and appropriate. While there is little new in the proposals of the author, they may well receive the consideration of contractors not already operating a satisfactory system of accounting, of which there are unquestionably too many. A study of the methods here outlined will put any contractor on the path to a correct knowledge of his business such as can only be obtained through the application of a complete bookkeeping and cost-keeping system.

"Arithmetic of Electricity." By T. O'Conor Sloane. Twenty-first edition. New York: The Norman W. Henley Publishing Company. Cloth, 162 pages (4¾x7 inches), illustrated with a few line diagrams. Supplied by Electrical Review Publishing Company, Inc. for $1.00.

Heralded as a revised and extended edition, this proves to be merely a reprint of the 1903 volume, ignoring the many simple solutions of both alternating and direct-current problems, which have been developed during the last 12 years. The "revision" consists in changing the date on the identical preface, and the "extension" in adding 32 pages of advertising. Many of the solutions offered are inexcusably cumbersome in these days when simple algebra is taught even in the grammar schools, and the glaring errors of earlier editions are calmly repeated, as in claiming that the maximum voltage of an alternating current is only 1.11 times the average voltage.

Albert Scheible.

"Wireless Transmission of Photographs." By Marcus J. Martin. London: The Wireless Press, Limited. Cloth, 117 pages (5½x8½ inches), illustrated. Supplied by Electrical Review Publishing Company, Inc. for $1.00.

At present the transmission of photographs by wireless methods is in a purely experimental stage, and the author of this volume has presented a narrative of the present stage of progress. He evidently has faith in the future possibilities of achievement along this line, and in the commercial need for a simple, rapid and reliable method, since the methods of wire transmission fail at long distances on account of the capacity of the line. The earlier chapters describe various attempts to solve the problem. The fourth chapter is devoted to synchronizing and driving. The fifth and last chapter describes the author's system of radiophotography, his apparatus having been named the "telephograph." Two appendices deal with selenium cells and the preparation of metal prints. What little there yet is of the subject is well covered, but the author assumes knowledge of wireless operation and the transmission of photographs over metallic circuits, and has not attempted to cover these subjects. His object is stated in the preface to be "to put future experimenters on the right track and prevent them from making expensive and fruitless experiments."

"Leçons sur le Fonctionnement des Groupes Électrogènes en Régime Troublé." By L. Barbillion. Paris: Gauthier-Villars et Cie. Cloth, 306 pages (5x8½ inches), 166 illustrations. Supplied by Electrical Review Publishing Company, Inc. for $2.50.

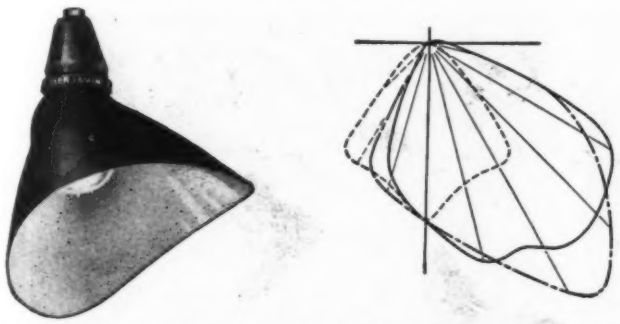
This volume constitutes a course of lectures regularly given by the author at Grenoble, where he is director of the electrical engineering department. The behavior of a generator driven by each of the customary prime movers is investigated, the treatment being largely mathematical. Speed variations are an important element in the operation of large machines and we know of no other study, so complete, of the regulation and control of direct-connected generators. The twelve chapters deal respectively with driving and resisting torques, periodic and transient speed variations, regulation and governors, operation without governor, operation with mechanical governor, direct and indirect control, determination of speed during perturbations, damping, practical control, compensation mechanisms, influence of compensation on character of perturbation, overcompensation. The book should have a wide distribution.

NEW APPLIANCES

A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

New Elliptical-Angle and Fluted-Bowl Reflectors.

In line with its policy of bringing out improvements and new developments in steel enameled reflectors from time to time, the Benjamin Electric Manufacturing Company, 128 South Sangamon Street, Chicago, has now marketed two new types of reflectors that are of considerable interest. The one shown in Fig. 1 is an elliptical-angle reflector which, as can be seen from the illustration, is a



Figs. 1 and 2.—Elliptical Angle Reflector and Distribution Curves Thereof.

Solid-line curve shows distribution in vertical plane through axis of lamp and perpendicular to wall. Dot-and-dash curve shows distribution in vertical plane making angle of 40 degrees with plane just referred to. Dotted curve shows distribution in plane parallel to wall.

new departure in angle reflectors because of its somewhat flattened or elliptical shape. Formerly angle reflectors threw the maximum light upon the wall or surface directly opposite them. The new reflector has been given this special shape so as to distribute the light more uniformly over the surface to be illuminated. This is done by increasing the light in angles around 35 and 40 degrees both with the horizontal and the vertical planes. By this increase in the lateral distribution the surface is very much more uniformly illuminated and the former rather weak illumination between units is brought up to the average. The lamps used with this reflector are hung vertical. The reflector is made in several sizes suitable for lamps ranging from 40 to 1,000 watts. The one illustrated is designed for 200-watt lamps. The reflector in this case has dimensions of 14 by 20 inches and the entire height of the fixture is 17.5 inches. Such reflectors are useful, not only for lighting bulletin boards, billboards, signs, and other vertical surfaces, but they are also very adaptable to the lighting of large open areas outdoors, such as tennis courts, handball courts, etc. For indoor use they have been found especially suited for foundries, erecting shops and large mills where traveling cranes prevent the mounting of lamps directly over the area to be lighted.

Fig. 3.—New Fluted Deep-Bowl Reflector.

In Fig. 3 is shown a new design of deep-bowl reflector which has a fluted or corrugated smooth surface. This fluting has been designed for the special purpose of reflecting the light so that it does not again pass through the lamp bulb, it having been found that the absorption of two extra passages of the light through the glass materially reduces the efficiency. By the new fluting the efficiency of the unit has been raised about 12 per cent. This particular type of reflector is made in 14 and 17-inch sizes for lamps ranging from 200 to 1,000 watts. The reflector is well ventilated and has an outside black enamel finish.

New Conduit Terminal Fittings or Pipelets.

Where wires emerge from an iron conduit or from an armored cable it is necessary to provide a special terminal fitting which will well insulate the wires from each other and from the conduit or armor of the cable. A new fitting of this type, known as the C. G. R. pipelet, has been placed on the market by Charles G. Robin, 48 Warren Street, New York City. These pipelets are made of glazed porcelain which is strong enough to prevent cracking or breakage. The base upon which the porcelain fits is made of gray

New Conduit Terminal Pipelet.

iron which is electrogalvanized and the screws are likewise treated. This fitting is very easily applied because it is necessary merely to fasten the base on the conduit or cable, then put on the porcelain cap and screw it down. The outlets in the porcelain are well rounded so that no strain or damage can come to the wires. This method of installing avoids twisting the wires.

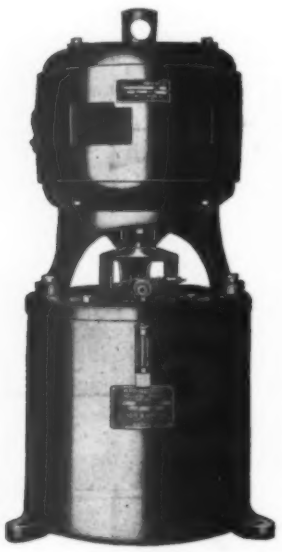
These pipelets can be used for meter loops, in motor installation, and in all places where a fitting of this type is necessary. They are intended for inside use only. These fittings are made for one-half, three-fourths and one-inch pipe sizes. The smallest size has either two or three wire outlets and the larger sizes each have three outlets. These fittings have been approved by the Underwriters' Laboratories.

New May-Nelson Electric Vacuum Pump.

The new vacuum pump developed by the May-Nelson Manufacturing Company, Washington, D. C., is of the oscillating-ring type. This pump consists of four essential parts: the body, impeller, cover and shaft, so arranged that the rotation of the shaft imparts an oscillatory motion to the impeller. In the body and impeller are a series of concentric grooves, and each ring so formed, dips into a corresponding groove in the other part. The grooves are connected in series by ports, and the action of the pump is obtained by the rolling contact made between the external cylindrical surface of one half and the adjacent internal cylindrical surface of the other half, which pushes the air or vapor ahead of it.

The new pump illustrated differs from the former design described in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, December 4, 1915, in the following features:

Water cooling and the piping it required has been eliminated. In its place the pump is entirely submerged in oil. It is not, however, an oil-sealed pump as there is no direct connection between the oil tank and evacuating parts of the pump. The oil is used for cooling and lubrication only.



New Type of Electric Vacuum Pump.

All bearings are lubricated automatically from the oil tank, and no attention whatever need be given them.

A new device is applied to the shaft which automatically keeps the impeller at the minimum point of clearance with the body, compensating for wear and eliminating the necessity for adjusting the clearance occasionally by hand.

The stuffing box has been eliminated, a feature which makes the pump especially suitable for handling dangerous gases.

This pump will produce a vacuum of 0.05 millimeter, and has a displacement of 3 cubic feet of free air per minute. It is equipped with a Robbins & Myers one-half horsepower motor, direct or alternating current as required.

New Type of Pulmotor for Saving Lives by Stimulating Natural Breathing.

To meet the evident demand for a device of this kind numerous attempts have been made to produce a hand-operated device for the resuscitation of victims of drowning, electric shock, mine accident, collapse and asphyxiation by poisonous gases. Such a machine has been developed, due to the fact that its inventors had the courage to go back to an obvious physiological principle long established and thoroughly proved in that notable life-saving device, the automatic Pulmotor. All previous attempts to develop a hand-operated resuscitation machine have resulted in machines which place the patient's lungs under the absolute control of a man at a pump, who in the majority of cases is an ordinary layman with little knowledge of the physiology of respiration. With such machines no account is taken of the fact that every individual has his own lung and breathing capacity, and that the slightest departure from these interferes very seriously with the success of the operation.

This new machine, which is known as the type B Pulmotor, overcomes these serious defects of the pump-controlled, hand-operated devices because it recognizes the physiological fact that lung capacities and the volume of air breathed by an individual vary greatly with his age, development, occupation and environment, but that the lung pressures vary only within narrow limits.

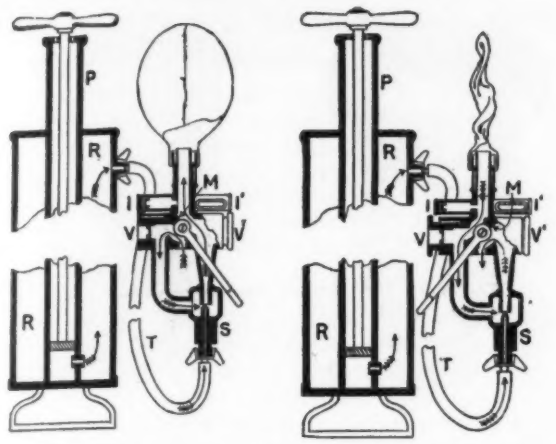
This machine is remarkable in that it is practically nothing more than a valve with indicators for measuring both inhalation and exhalation pressures. Interposed between a pump or oxygen cylinder and the patient's lungs, it measures, regulates and registers the exact pressures, both of inhalation and exhalation, exerted in the lungs. The operator does not attempt to regulate the volume of air exchanges or the rate of respiration; these are all controlled by the patient's lung capacity, just as in natural breathing. The operator simply moves the valve lever handle to right or left for inhalation or exhalation when the indicator gauges show him that the proper and natural lung pressure of either inhalation or exhalation has been reached.

New Type B Hand-Operated Pulmotor in Use for Resuscitation Work.

When the lever handle is at the extreme right, air or oxygen from a pump or cylinder passes through the Pulmotor valve in a controlled flow to the patient's lungs. As they fill to their normal expansion, their resistance is registered on the inhalation gauge. By watching this, the operator can tell when to move the lever to the extreme left for exhalation.

This closes the direct passage to the lungs, and the air from the pump escapes through a bypass in the Pulmotor valve, drawing with it the air in the lungs, thus gently assisting them in their natural collapse. As they deflate, their action is accurately measured on the exhalation gauge. By watching for the indicator in the gauge to come to rest, the operator can know when to move the lever for the next inhalation. These operations are continued until the patient is strong enough to breathe without assistance.

The smaller the patient's lung capacity the more quickly will his lungs fill and the more quickly will the indicators reach



Diagrams Showing Operation of New Pulmotor Valve in Inhalation and Exhalation Positions.

their maximum point of travel. Hence the more rapidly must the lever be moved and respirations caused. This is entirely in accordance with nature, and is in itself a convincing demonstration of the naturalness of the respirations produced.

The pressure gauges perform another valuable function—that of signaling the operator when and how the patient wishes to resume breathing. If he should attempt to inhale, the indicator in the exhalation gauge will move to the right and center. If he should attempt to exhale, the indicator in the inhalation gauge will move to the right and away from the center. By watching the indicators the operator can continue to assist the patient until he is well on the road to recovery. Yet even if the operator did not work the machine in harmony with the patient, the latter could resume breathing of his own accord while the mask is on, and independent of the operation of the machine. It is impossible to suffocate or gag the patient, or injure the lung tissues by failing to operate the machine properly.

In order to make the type B Pulmotor available for every conceivable use, it is provided with two milled-headed escape valves, one for inhalation, and one for exhalation. By adjusting these, the operator can obtain instantly and hold any combination of inhalation and exhalation pressures the case calls for, regardless of the efforts of the man at the pump.

The new machine, which weighs only 12 pounds with all accessories, is expected to find its greatest field as a supplement to the standard Pulmotor. Its compactness and portability make it ideal for emergency work. It is manufactured by the Draeger Oxygen Apparatus Company, 422 First Avenue, Pittsburgh, Pa.

Fiber-Shell Sockets for Candle Fixtures.

On account of the increasing popularity of wall brackets equipped to resemble candle fixtures, there has arisen a demand for a socket especially adapted for this purpose. To meet this the firm of Harvey Hubbell, Incorporated, Bridgeport, Conn., has placed on the market a new fiber-shell socket which is fitted with a standard metal screw base and is designed for attachment to tubing, which with the socket is entirely covered by a glass candle.

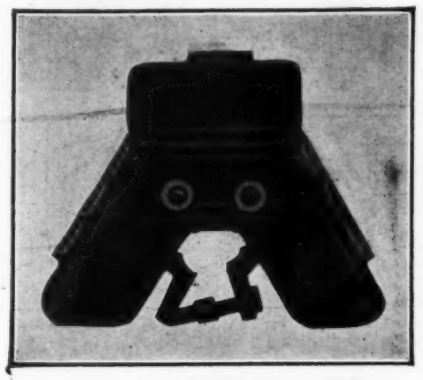
Candle Socket.

An important feature of this socket, which probably will make it especially desired by electrical interests, is that it provides for liberal wiring room by means of a special formation of the contact posts. The usual form of the Hubbell lugs is also used and these are sure to keep the wire in its proper place under the heads of the binding screws.

The socket has a highly glazed finish which serves to make the candle imitation still more complete.

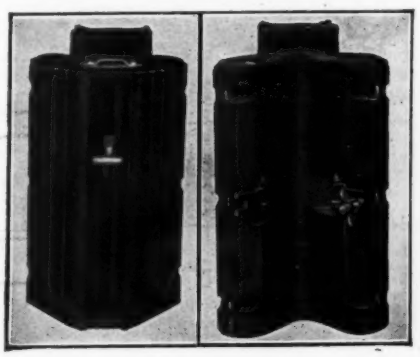
Dimmer for 1,000-Watt Spotlight

The tungsten spot or lens lamp is rapidly replacing the ordinary hand-fed arc lamp as a means for portable stage lighting. To increase the value of this lamp for this purpose, the Ward Leonard Electric Company, Mount Ver-



Top of Case of Spotlight Dimmer, Showing Terminals.

non, N. Y., has put on the market a device known as a spotlight dimmer. The accompanying illustrations show several views of one of these dimmers designed for a 1,000-watt gas-filled tungsten lamp. It is designed to be mounted on an upright lamp support. This 1,000-watt dimmer has all its live parts inclosed. It is comparatively light in weight, even though it has 50 steps of control and will dim a 1,000-watt lamp from full candlepower to



Front and Back Views of the Dimmer.

blackness. The construction is well shown in the cuts. The control handle moves up and down in the slot. The terminals are carried to an inclosing box.

New Small Industrial Oil Switches.

The type of switch illustrated herewith is used for starting and protecting three-phase induction motors up to 10 horsepower and 600 volts. It conforms strictly to "safety-first" principles. There are but few operating parts and these are supported from the switch frame, which can be mounted on any flat vertical surface, such as a wall or post, or by supports on the motor-driven machines which

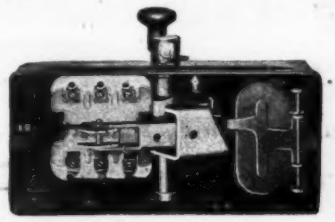


Fig. 1.—Oil Switch with Double Inverse-Time-Limit Trip.

Fig. 2.—Oil Switch with Low-Voltage Release.

the switches control. All operating or live parts, with the exception of the switch handle, are inclosed. The contacts are under oil and the terminals are in the interior of the frame, which is provided with a tight-fitting sheet-steel cover.

This switch is built in several forms, as follows: nonautomatic, with two-coil series overload time-limit trip, with plain low-voltage release and with combined low-voltage and overload protective plugs. All switches are arranged for either open or conduit wiring.

They open by gravity, assisted by torsion springs, and have a quick downward double-break per phase. The mechanism is accurately constructed and parts are interchangeable. "On" and "off" on the frame indicate whether the switch is open or closed.

The current-carrying parts are liberally proportioned to secure low temperature rise and long life. The switch studs and movable contacts are mounted in a porcelain block and separated by porcelain barriers. Contacts, terminals, etc., are securely held in place by lock washers, preventing loosening from vibration. The stationary contacts consist of drop-forged fingers with flared ends. The movable contacts are copper strips bent to special form.

The nonautomatic switch is held closed by a latch. In opening, the handle is moved some distance before the latch releases, after which the contacts are rapidly snapped open.

The automatic switch with two-coil series overload time-limit trip is opened automatically on overload by a trip-coil plunger. The switch cannot be held closed on overload or short-circuit. Overload trip setting can be varied between the normal current rating of the trip coil and twice normal by a calibrating device in the tube sur-

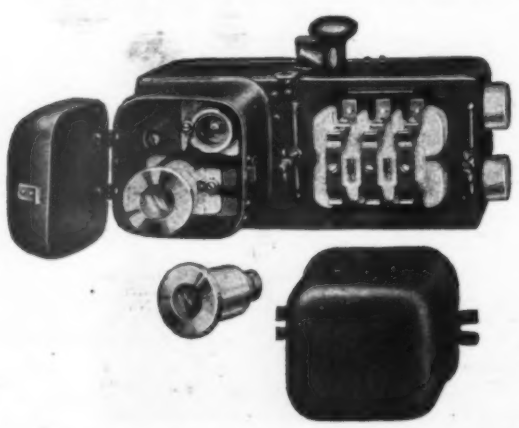
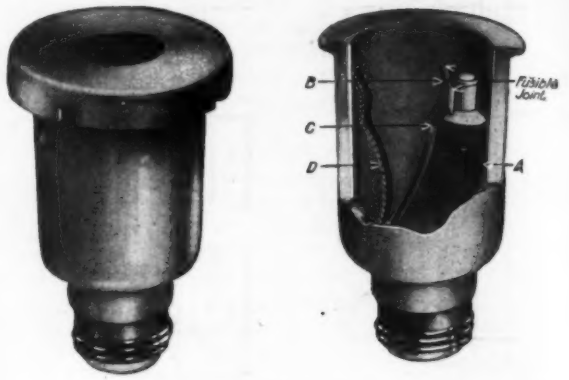


Fig. 3.—Oil Switch with Low-Voltage Release and Time-Limit Protective Plugs.



Figs. 4 and 5.—Exterior and Interior Views of Protective Plugs.

rounding the lower portion of each trip-coil plunger. After a current setting is made, the device is locked in position by a set screw. Each trip coil is individually calibrated and the tube is then marked in legible white numerals on the black background of the tube.

For time delay in automatically opening the circuit, each overload trip coil is equipped with an inverse-time-limit attachment consisting of an oil dashpot connected to the tripping plunger. The time setting is accomplished without removing the dashpot from the calibrating tube. At proper setting, protection is afforded to the motor against overload and against running single-phase, but at the same time the switch is prevented from opening while the motor is starting. The calibrating tubes and oil dashpots are protected from injury by a sheet-steel case attached to the switch frame, which also prevents dust or lint collecting in the tubes.

The switch with low-voltage trip is opened instantly by a low-voltage release, if the line voltage falls to approximately 50 per cent of normal. To reduce the watt loss of the low-voltage trip to a minimum, a small auto-transformer is used in conjunction with the low-voltage release coil, except at 110 volts with 60 and 40 cycles, where the transformer is not necessary.

Switches with overload protective plugs and low-voltage trip are similar to the switch just described, but are equipped also with time-limit overload protective plugs connected in series with the switch leads. In this case overload protection is obtained by two time-limit, protective plugs. These plugs contain a stationary contact post with heating coil *A*, Fig. 5, and a fusible link *B*, which binds a spring contact arm *C* to the stationary post. The heating coil is in the motor circuit, which also passes through the post, link and spring contact arm. When the post is heated to a temperature that will melt the low-fusing alloy that holds the link together, the spring contact arm is released and takes the position as shown by the dotted line, *D*, thereby opening the circuit between the arm and the post. After the circuit has been opened by the protective plug a new link should be installed.

By reason of the time lag in the heating coil, the momentary inrush of starting current will not cause the plug to open the circuit. The plugs guard the motor against any conditions of overload that, if maintained for a sufficiently long period, would overheat the motor. Under the conditions obtaining when polyphase motors are running single-phase, or when an attempt is made to start stalled motors, or when a motor is called upon to drive too heavy a load, the plugs will open the circuit, if properly applied.

These oil switches are designated as type F, form P-10. They are manufactured by the General Electric Company, Schenectady, N. Y.

Multiple-Contact Motor-Starting Knife Switches.

For use as a simple and inexpensive method of starting rotary converters from the direct-current end and of starting direct-current motors of large capacity having starting conditions that will permit cutting out the starting resistance in four steps, the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has developed a line of motor-starting knife switches, of which the one illustrated is typical.

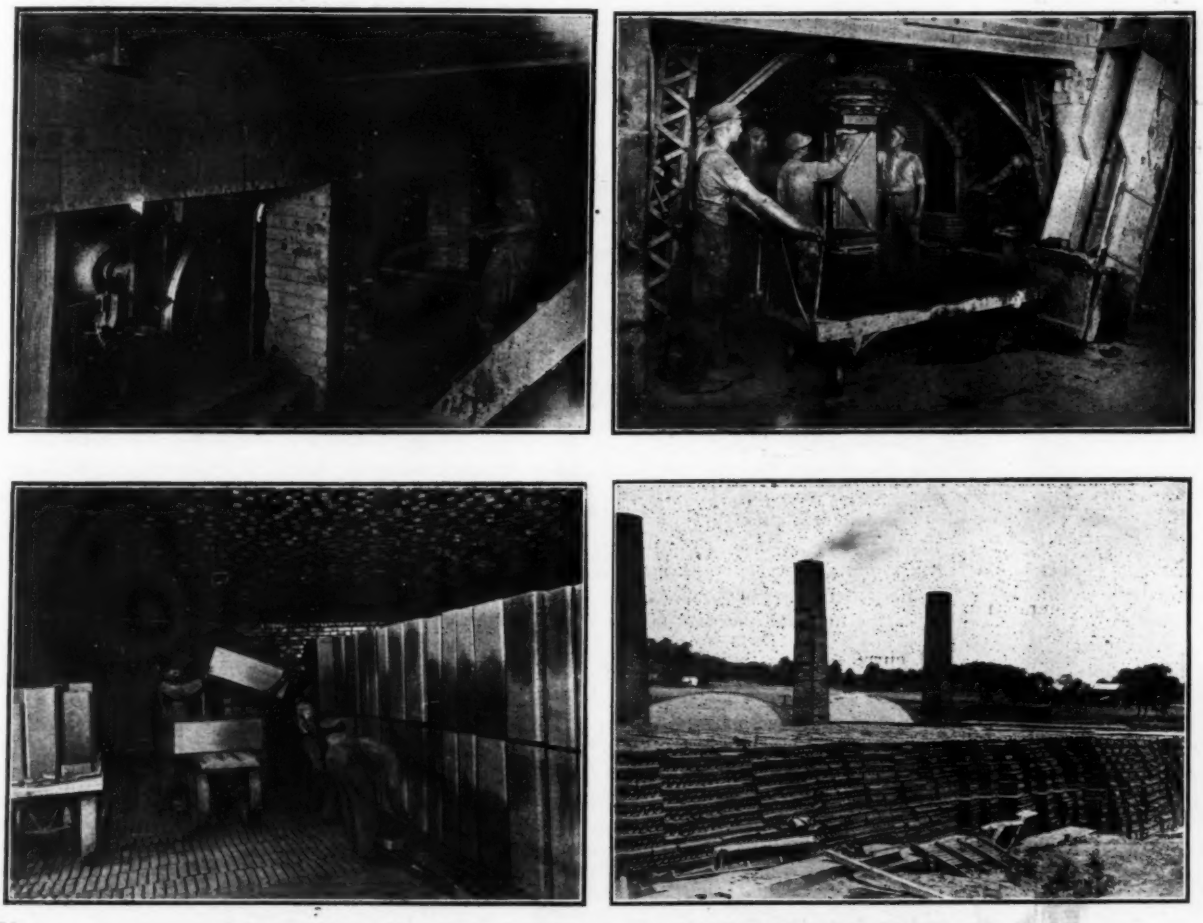
These multiple-contact switches are for use on circuits up to 600 volts, and are made in two types for starting capacities from 300 to 3,600 amperes. They are intended for starting conditions only, being rated in terms of the starting current. They will, however, carry one-fourth their rated current continuously. Unless the full-load current is only one-fourth of the starting-current rating, a short-circuiting line switch or circuit-breaker should be used to carry the running load.

These motor-starting switches have four sets of contacts which are of such length that the switch blade makes contact with each set in succession. Each switch has four blades, a construction that allows of ample ventilation and thereby prevents overheating, and also reduces the depth of the switch from the switchboard.

Motor Switch.

To prevent large machines from being started too quickly by throwing the switch through all the positions without stopping on any one position, a ratchet device is provided on the switches for starting capacities of from 1,200 to 3,600 amperes. This device has a stop for each position, and it is necessary to release this stop before passing to the next position, thus insuring that the machine being started has time to accelerate as the resistance is gradually cut out point by point.

These switches are furnished with terminal lugs and are arranged for mounting on panels from 1.25 to 2 inches thick.



Typical Views in the Conduit Factories of the National Fire Proofing Company.

Tile conduit has been used for the protection of underground electrical conductors practically from the time that underground construction came into use. It has several excellent properties that adapt it for this purpose. Of the types of tile conduit best known in the industry are McRoy and Camp conduits, which have been used for over twenty-five years. These conduits are made in both single and multiple duct by a highly perfected process in the two conduit works of the National Fireproofing Company at Aultman, Ohio, and Brazil, Ind. Typical views in these plants are shown above. An excellent quality of clay is brought both from open cut and mine and broken up in the dry pans. It is then thoroughly mixed and tempered in the wet pan shown in the first illustration. When of the proper consistency it is taken to the molding presses, one of which is shown making multiple-duct tile. After drying, the conduits are stacked in the kilns and carefully burned. The loading of a kiln is shown in the lower left view. After being removed from the kilns, the conduits are placed in stock for shipment. The fourth view shows one of these stock piles adjoining some kilns. These large stocks, combined with excellent shipping facilities, permit the company to fill orders speedily. Among other products made by the company are Natco building and sewer tiles, as well as a variety of fireproofing products, both glazed and unglazed.

INDUSTRY ACTIVITIES

Mechanical Specialties Company, Peoples' Gas Building, Chicago, Ill., has issued circulars on the Larock wrench, which has a compound grip movement, for use in conduit and other work.

Wagner Electric Manufacturing Company, of St. Louis, Mo., announces the removal on July 15 of its Detroit office to 1291 Woodward Avenue, to continue in charge of Dean Emerson.

J. G. White Companies, of New York and London, have issued a 32-page booklet entitled "Engineering in Foreign Fields." The booklet is profusely illustrated, and shows the construction of hydroelectric developments, power plants, electric railways and other electrical works in many countries.

Benjamin Electric, Limited.—B. J. Grigsby, managing director of the Benjamin Electric, Limited, 1a Rosebery, London, E. C., England, manufacturer of electrical specialties, reflectors, etc., sailed from England on June 24th for a five weeks' business trip in the United States. His business address will be 24 Mayer Building, Peoria, Ill.

The Vacuum Cleaner Company, 95 Liberty Street, New York, N. Y., announces that Judge Mayer in the United States District Court for the Southern District of New York, has rendered a decree that the **Innovation Electric Company, Incorporated,** has infringed the fourth claim of letters patent granted to David T. Kenney, No. 847,947, and owned by The Vacuum Cleaner Company.

Century Electric Company, St. Louis, Mo., has established branch offices in the Rockefeller Building, Cleveland, O., and Dime Bank Building, Detroit, Mich. These sales offices have been established with the object of caring for the requirements of its customers in those territories in a more satisfactory manner. A stock of motors will be carried in warehouses at both Cleveland and Detroit.

Sprague Electrical Works of the General Electric Company is contemplating the erection at Watsessing, Bloomfield, N. J., a six-story power plant of concrete construction, having a frontage equal to that of four city blocks. The dimensions will be 800 by 75 feet. Plans are being made by the company's architects, under the supervision of C. G. Hulth, of Schenectady, N. Y. It is estimated that the cost of the improvement will exceed $800,000.

Edison Storage Battery Company, Orange, N. J., has issued a 32-page booklet, "On the Firing Line With Battery Bill," which is a collection of illustrated letters supposed to have been written home from the "road," by W. Alkaline Battery, this company's unique salesman, telling of his experiences in selling Edison batteries to President X and other officers and men down the line of the X. Y. & Z. Railroad. Written in a humorous style, the booklet is a departure from "ordinary" advertising and contains a large fund of valuable battery information.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., is furnishing the electric motors being used for the Gainaday electric washer and wringer, which is manufactured by the **Pittsburgh Gage & Supply Company,** Pittsburgh, Pa. This is a high-grade cylinder-type washer which was described in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, of May 15, 1915. At that time it was known as the Pittsburgh Electric Washer. The excellent results obtained with the machine have suggested the name Gainaday as typifying the economy in time and labor obtainable by its use.

Cutler-Hammer Manufacturing Company, of Milwaukee, Wis., has issued a new edition of its automobile lighting switch booklet, which shows several assemblies of C-H switches installed on some of the well-known cars and shows a phantom view which gives clearly the three-piece construction and the operation of the switch. The booklet includes wiring diagrams giving methods of wiring for single lamps and various combinations. Over a million of these switches are in use.

Norton, Bird & Whitman, engineers, of 111 West Monroe Street, Chicago, Ill., and Munsey Building, Baltimore, Md., have published the first issue of their "Monthly Rate Letter." This is being offered to their clients and correspondents in the belief that the subject of rate regulation is a matter which can be frankly discussed to the advantage of every one interested. In the first issue, charts are given showing charges for residence lighting in different cities of this country, and also digests of a number of recent decisions regarding rates.

Hamilton-Beach Manufacturing Company, Racine, Wis., has appointed W. Harvey Kelley chief of its advertising staff. Mr. Kelley's merchandising and advertising experience covers a period of 17 years, and embraces executive connections with the largest manufacturers and jobbers in the electrical industry, including three years with the Julius Andrae & Sons Company, Milwaukee, and four years with the Western Electric Company. He has been added to the Hamilton-Beach organization to give merchandising and advertising counsel and co-operate with its jobber customers and their dealers.

Diehl Manufacturing Company, of Elizabeth, N. J., has issued Bulletin No. 107, on type K direct-current motors and generators, which are designed to meet conditions different from the general rules which govern the performance of slow or medium speed electrical apparatus. The machines are featured for high speeds with low temperature rise, good commutation at all loads and speeds, and by the adaptability of the design by the use of auxiliary or commutating poles to adjustable speeds by field control. The cylindrical form and reduction in size has made the distance from center of shaft to base a minimum. The bulletin gives a description and illustration of the construction of type K machines, as well as a number of illustrations of their applications.

Western Electric Company, Incorporated, New York City, has issued a new catalog of Inter-phones and accessories. The complete line of Inter-phones, the company's trade name for the intercommunicating telephone it manufacturers, is shown at length. The various systems available for intercommunication are fully explained with diagrams showing the service given by each. This is accompanied by complete information as to the amount of wire and cable required as well as the operating battery requirements. Several new systems have recently been developed to meet new requirements and all of these are listed. They include among others a new annunciator system arranged for from 10 to 70 stations or more, and a new apartment-house system to provide for inexpensive and flexible installations. The new catalog gives all the information needed by the dealer or contractor who would select, install and operate an Inter-phone system designed to meet practically any known requirement for intercommunicating telephone service.

PERSONAL AND BIOGRAPHICAL

MR. WALTER NEUMULLER, who was unanimously elected chairman of the New York Companies' Section of the National Electric Light Association at the third annual convention held on the evening of July 17 in New York City, is well known in central-station circles throughout the country.

Walter Neumuller.

Mr. Neumuller has taken an active part in many electric lighting and allied organizations. His work for five years as assistant secretary of the Association of Edison Illuminating Companies and also as a member of the executive committee and former secretary of the exhibition committee of the National Electric Light Association has met with wide approval. Born in New York City, June 21, 1886, Mr. Neumuller has been connected with the New York Edison Company for sixteen years, most of which time he has been closely associated with MR. ARTHUR WILLIAMS. Possessing the particular qualities which especially fit him for central-station organization work he has by conscientious work and application won rapid advancement. As special representative of the New York Edison Company he ascertains by careful study and observation as well as by personal contact wherein the company's commercial policy is lacking, and suggests methods of further increasing the friendly relations existing between the utility and its patrons. He is a director and treasurer of the Electrical Show Company, director and treasurer of the New York Electric Vehicle Association and a member of the National Electric Light Association, New York Electrical Society, Illuminating Engineering Society, Electric Vehicle Association of America, Jovian Order, New York Press Club, Salmagundi Club, and the Siwanoy Country Club.

MR. L. S. MONTGOMERY, district manager of the Buffalo, N. Y., office of the National Metal Molding Company, of Pittsburgh, Pa., and Apollo in the Eleventh Jovian Congress, is on the Mexican border with Troop I, First Cavalry, New York National Guards.

MR. H. D. CRAWFORD, of Parker, S. D., was recently appointed superintendent of the municipal electric-lighting plant at Howard, S. D.

MR. R. E. CUTHBERTSON, formerly with the Empire District Electric Company, of Joplin, Mo., has been made secretary of the Elyria (O.) Electric Light Company.

MR. CHARLES G. COOK has been appointed assistant division agent, southern division, of the Public Service Electric Company, with headquarters at Trenton and Camden, N. J.

MR. GEORGE B. MULDAUR, formerly connected with the Society for Electrical Development, is now traveling secretary of the National Electric Light Association, with headquarters at 29 West Thirty-Ninth Street, New York City.

MR. H. S. WILSON has recently been appointed general manager of the Lane Manufacturing Company, of Waterbury, Conn. He recently resigned the position of engineer and manager of the New England Engineering Company, of the same city.

MR. C. H. CHAMPION was recently made manager of the electrical department of H. Boker & Company, metal dealers, of New York City. Formerly Mr. Champion was vice-president and general manager of the Kamden Electric Company, of New York City.

MR. H. M. KOHN has accepted the appointment of commercial manager of the Birmingham (Ala.) Railway Light & Power Company, a subsidiary of the United Gas & Electric Engineering Corporation, for which Mr. Kohn has conducted a number of sales campaigns.

MR. B. E. JACK, formerly new-business manager of the Salina (Kan.) Light, Power & Gas Company, has taken a similar position with the United Water, Gas & Electric Company, Hutchinson, Kan. MR. C. L. DUNN, of the Durham (N. C.) Traction Company, has succeeded Mr. Jack at Salina.

MR. W. C. WILLIAMS has recently been appointed manager of the Cincinnati branch office of the Robbins & Myers Company, of Springfield, O. MR. G. H. LIEBEL, the former manager of this office, resigned to devote his time to the Liebel Manufacturing Company, of Cincinnati, as announced in last week's issue.

MR. J. NORMAN PIERCE, who last month was re-elected president of the Electrical Contractors' Association of the State of Illinois, is one of the leading and best known contractors in the state. Although only thirty-three years old, he has had a very extended experience in the electrical construction industry and is a splendid example of a self-made man. Raised in the Ozark Mountains, where the struggle for existence is a rigorous every-day problem, he early developed that serious view of life which emphasizes the need for careful planning to meet its daily vicissitudes. From the age of twelve, when he came to Chicago, he had to make his own living. All spare time was devoted to education and, with the aid of evening schools and assiduous home study, Mr. Pierce became well versed not only in electrical science but in literature, philosophy and other cultural subjects. As a journeyman electrician he mastered the electrical construction art so capably that he was given the responsibilities of foremanship at the age of eighteen. His experience extended to practically all branches of work, including the wiring of battleships and steam-railroad car-lighting outfits. About ten years ago, with his elder brother, Paul, he established the Chicago electrical contracting firm of Pierce Electric Company. This firm has for many years been specializing in theater and factory work. By careful study of all details and systematic planning of the entire work, the firm has earned the reputation for being one of the few electrical contractors that has mastered theater wiring so as to make it remunerative. Mr. Pierce is an active member of the Chicago, the Illinois, and the National Contractors' Associations. He is also one of the managers of the Electric Club-Jovian League of Chicago.

OBITUARY.

MR. J. HARRY PIEPER, engineer of the department of illumination and electric vehicles of the Southern California Edison Company, died on Tuesday, July 11. Mr. Pieper was undoubtedly one of the most conspicuous and best beloved of the electrical men on the Coast. He gave himself unreservedly to the service

J. Harry Pieper.

of his company and his fellows in the industry, and his death will come as a terrific shock to a host of friends and acquaintances. Mr Pieper had taken a prominent part in the development of things electrical, was one of the organizers of the Southern California Section of the National Electric Light Association, a member of many other engineering, scientific and civic organizations, a past president of the Jovian Electric League and past president of the Advertising Club of Los Angeles.

CURRENT ELECTRICAL NEWS

Weekly Record of Construction Activities

EASTERN STATES.

AUGUSTA, ME.—The Public Service Commission has received application from the Vassalboro Electric Light & Power Company for permission to issue $30,000 in capital stock and $40,000 in bonds for the acquisition of waterpower and other sites, and generating and transmission equipment.

ST. ALEANS, VT.—The Public Electric Light Company, of this city, has been granted permission by the Village Trustees of Jeffersonville to erect a distribution system and furnish electric service in that city.

BROCKTON, MASS.—Plans have nearly been completed for the installation of a white-way system on Main and Center Streets. The Edison Illuminating Company will make the installation of 68 lamps and will furnish energy for their operation.

NORTH ANDOVER, MASS.—The Brightwood Manufacturing Company is making plans for the construction of an electric power plant at its mill. It is proposed to install a 50-kilowatt turbogenerator.

PALMER, MASS.—The Warren substation of the Central Massachusetts Electric Company, of this city, was recently destroyed by fire. The loss is estimated at $10,000 and the substation will probably be rebuilt at once.

WATERBURY, CONN.—The Electric Light, Water & Land Company has been incorporated here with a capital of $25,000.

DUNKIRK, N. Y.—F. W. Ballard, consulting engineer, Cleveland, O., has submitted a report to the City Commissioners recommending improvements and extensions to the municipal electric-lighting and water plants at an estimated cost of $200,000. The purchase of the franchise of the Dunkirk Electrical & Power Company is also recommended.

FALCONER, N. Y.—It is reported that the Jamestown Lighting & Power Company has purchased the local electric-lighting plant from Fred Sprague for $9,000.

MIDDLETOWN, N. Y.—The Public Service Commission is considering the proposed consolidation of the Orange County Lighting Company, of this city, the Orange County Power Company, the Port Jervis Lighting & Power Company and the Murray Lighting Company, of Monticello.

NEW YORK, N. Y.—The Interborough Rapid Transit Company has purchased a tract of land in Jerome Avenue near Kingsbridge Road on which it plans to erect a transformer station for the operation of Jerome Avenue subway and elevated roads.

OGDENSBURG, N. Y.—Announcement has been made of the purchase of the bonds of the Ogdensburg Power & Light Company, the Ogdensburg Railway Company and the Ogdensburg Gas Company by the Aluminum Company of Massena. The purchase price was in the neighborhood of $600,000. The Aluminum Company has large holdings in Massena and in recent years has expended large sums for the transmission of electrical energy throughout northern New York and in the development of waterpower sites.

OLD CHATHAM, N. Y.—A lighting district probably will be formed in this village, service to be provided by the Chatham Electric Light Company.

POTSDAM, N. Y.—The St. Lawrence Transmission Company, of this city, is obtaining right of way for a transmission line from the village of Pyrites to Heuvelton. From the latter place an extension will run westward to Morristown. The extension to Heuvelton will be similar in construction to the lines radiating from the company's power plant at Hannawa Falls. The towers will be of the flexible steel type, 75 feet in height. The extension from Heuvelton to Morristown is to be erected by the Gregory Lighting Company, of Morristown, which has a contract for Hannawa power.

RIPLEY, N. Y.—Alfred Huntington, who recently purchased the holdings of the Ripley Electric Company, has received permission from the Public Service Commission for the construction of an electric-lighting plant and distribution system in Ripley.

UTICA, N. Y.—The Utica Gas & Electric Company is making plans for extensive improvements to its system.

BAYONNE, N. J.—The Public Service Electric Company will install a new ornamental street-lighting system on Broadway, to be completed by December 15. All feed wires will be underground.

BLOOMFIELD, N. J.—Fries Brothers, manufacturers of chemicals, will build a new power house at their plant.

CEDAR GROVE, N. J.—The Township Committee is planning for the installation of a street-lighting system on all important thoroughfares.

HAMMONTON, N. J.—The City Council is considering the installation of extensions to the electric-lighting system.

HARRISON, N. J.—The City Council is planning for the installation of a new street-lighting system on Harrison Avenue, to consist of flaming arcs.

JERSEY CITY, N. J.—The Public Service Electric Company is arranging for the immediate installation of a new street-lighting system on Grove Street, to include poles and lamps. The new system is to be completed by September 15.

PHILADELPHIA, PA.—The Philadelphia Electric Company is arranging for an increase of about $25,000,000 in its capital, to provide for extensive improvements and additions to its plant and system. A new power plant is to be erected in the northeast section of the city.

WAYNE, PA.—The borough improvement committee is planning for the installation of an improved street-lighting system.

WHITEHALL, MD.—It is reported that plans are being made by J. P. Mays, M. N. Faulk and J. F. Wiley for the installation of a transmission system to supply electrical energy for private consumption here.

MARSHALL, VA.—The Marshall Electric Light Company has been incorporated with a capital of $5,000 by C. F. Ramey and A. Utterback to furnish electric service here.

MORGANTON, N. C.—The Western Carolina Power Company, a subsidiary of the Southern Power Company, of Charlotte, has drawn plans and specifications for the Bridgewater hydroelectric development on the Catawba River, ten miles above Morganton.

GAINESVILLE, GA.—The Georgia Railway & Power Company of Atlanta has purchased the holdings of the Gainesville Railway & Power Company for approximately $180,000. The property consists of eight miles of street railway in this city, hydroelectric plant, street-lighting and distribution systems and other holdings.

ST. CLOUD, FLA.—The Central Florida Interurban Railway Company has been incorporated with a capital of $100,000 to build an electric railway from St. Cloud to Sanford, Fla. C. E. Carlson is president of the company.

NORTH CENTRAL STATES.

AKRON, O.—The Northern Ohio Traction & Light Company, of Akron, has made application to the Public Utilities Commission for permission to issue $14,075,000 in bonds, the proceeds to be used to refund outstanding bonds, retire present obligations of the company and for proposed improvements, to cost about $1,955,300.

CANFIELD, O.—The City Council has granted the Canfield Gas & Electric Company a 25-year franchise and it is expected that within a few months a new electric-lighting plant will be in operation here.

COLUMBUS, O.—The City Council has passed an ordinance of granting permission to the Columbus Railway Power & Light Company to construct a $300,000 power plant on its Kimball Street site just north of Broad Street. The company will build its plant 50 feet west of the levee and will construct a new retaining wall.

KENTON, O.—The Hardin-Wyandott Lighting Company has been authorized by the Public Utilities Commission to issue $25,000 in bonds, the proceeds to be used for the erection of a transmission line between this city and Upper Sandusky.

ST. MARYS, O.—A bond issue has been voted for the rebuilding of the municipal electric-lighting and water plants.

DAYTON, IND.—Plans for improvements to the city electric-lighting system are being made.

EVANSVILLE, IND.—Improvements to cost in the neighborhood of $140,000 have been started in the electrical department of the Evansville Public Utilities Company. The most important improvement is a new switchboard to be installed at the power station and which will cost about $100,000.

LAPORTE, IND.—The County Commissioners will make an expenditure of $10,000 for the erection of a power plant for the courthouse and jail. It is expected that the construction work will begin at once so that the plant can be placed in service late in the fall.

ALBANY, ILL.—The Town Board is making arrangements to let a contract for construction for a municipal electric-lighting plant about August 1.

BONDVILLE, ILL.—The Bondville Electric Light Company has been incorporated with a capital of $1,500 by J. C. Flowers, G. B. Talbott and others to furnish electric service here.

CHICAGO, ILL.—Plans for installing 232 600-candle-power gas-filled lamps in East 63rd Street between Cottage Grove and Stony Island Avenues were discussed at the annual meeting of the Woodlawn Business Men's Association. The estimate cost of the system is $32,000.

EAST ST. LOUIS, ILL.—Generating equipment and a switchboard will be installed in the power house at the city high school. W. C. Watkins is receiving inquiries.

GRAND RAPIDS, MICH.—A boulevard lighting system will be installed on Division Avenue between Goodrich and Wealthy Streets.

MARQUETTE, MICH.—The Marquette County Gas & Electric Company will, during the present year, spend approximately $63,000 on improvements, according to a statement made by John McDougal, manager of the company. A 1,000-kilowatt turbogenerator and a 500-horsepower boiler have already been purchased. Other equipment will be added later in the year.

STANDISH, MICH.—The Standish Electric Light & Power Company has been incorporated with a capital of $5,000 to furnish electric service here.

CLINTON, WIS.—An ornamental lighting system is to be installed in this city.

MILWAUKEE, WIS.—Construction has already been commenced on a new general office building for the Wisconsin Telephone Company on Broadway. The building will be eight stories high and will cost over $700,000.

MILWAUKEE, WIS.—The Wisconsin Railroad Commission has granted a permit to the Milwaukee Electric Railway & Light Company to purchase the property of the Commonwealth Power Company of Milwaukee for $1,100,000. The former company was authorized to issue $300,000 of its notes to be used for paying for the property of the Commonwealth Power Company and $1,000,000 in notes to reimburse its treasury for cash used in buying the property and for making improvements and extensions to the plant and system.

GIBBON, MINN.—Bids will be received until August 1 for furnishing electric lamps and energy for a term of 10 years. C. W. Carlson is Village Clerk.

SAUK CENTER, MINN.—Bonds have been voted for the erection of an electric-lighting plant here.

ELLSWORTH, IOWA.—Bonds in the sum of $4,500 have been voted for the installation of an electric-lighting plant here.

FAIRBANK, IOWA.—Citizens here have

voted to issue bonds for the installation of an electric-lighting plant.

GRINNELL, IOWA.—The Grinnell Electric & Heating Company has made application for a franchise to supply electrical energy for private consumption in the town of Searsboro.

MAPLETON, IOWA.—Work will soon be commenced on the erection of an electric-lighting plant here.

CONCORDIA, KANS.—The Concordia Electric Light Company has asked the Public Utilities Commission for permission to issue $15,000 in stock.

GARFIELD, KANS.—An election to vote on the proposition of issuing $10,000 in bonds for the installation of an electric-lighting system probably will be called by the City Council.

HIGHLAND, KANS.—W. V. Warner is negotiating with the owners of the electric plant in Hiawatha for the purpose of securing energy for his plant here.

HADAR, NEB.—The Nebraska Electric & Gas Company has been granted a franchise to install an electric-lighting system here and furnish 24-hour service.

FREEMAN, S. D.—Plans are being made to connect the local electric-lighting system with that of the town of Marion and provide service for the rural community between the two towns.

SHERWOOD, N. D.—E. T. Clark, of the Sherwood Electric Company, announces that an addition will be built to the power house for the installation of new generating equipment.

SOUTH CENTRAL STATES.

FRANKFORT, KY.—J. N. Moreland, of the Frankfort Milling Co., is considering the electrification of his flouring mill and elevator here. The present steam power plant of the mill is inadequate for the requirements.

LEXINGTON, KY.—The Lexington Roller Mills Company has installed an electric motor for operation of the elevator mechanism at the mill. The cost of this operation will be compared with the cost of steam operation and the result will decide the company as to changing over altogether to electrical drive.

LEXINGTON, KY.—Work will begin shortly on additions to the boiler plant of the Lexington Utilities Company, to increase the boiler room space by 50 per cent and the power capacity by 20 per cent.

A contract for erection of the boiler room addition has been let to the Armstrong Engineering Company, of Taylorville, Ill., according to a statement by F. W. Bacon, vice-president and manager. A contract has been let for a 500-horsepower boiler to add to the battery of five now in use. The new boiler will give the plant a rated capacity of 3,000 horsepower, but the company expects to operate at 225 per cent of this capacity, this type of boilers usually running higher than rated. The company will buy the new franchise on August 1, after which, according to Mr. Bacon, new equipment will be purchased.

MAYFIELD, KY.—The city and the Mayfield Water & Light Company have been unable to reach an agreement as to the proposal of the city to acquire the property. A price of $275,000, set by the company, is considered too high by the city, and the proposed reduction of light and water rates under a new franchise is being considered. It is expected that the whole matter will be disposed of by arbitration.

MT. STERLING, KY.—Mayor C. K. Oldham, R. G. Kern and R. H. Winn have been named as a committee to investigate the cost of a municipal lighting plant for the city and the advisability of a bond issue for $30,000, to report at the August meeting of the City Council.

BENTON, TENN.—The Benton Light & Power Company, recently incorporated, has organized, electing J. D. Clemer president, and J. E. Cook, secretary-treasurer. A contract has been let to W. T. Bidwell at $2,400 for erection of the distribution system and a contract for service has been let to the Tennessee Power Company.

NASHVILLE, TENN.—The City Council is considering an ordinance which provides for a bond issue of $1,500,000, the proceeds to be used for the erection of a municipal electric-lighting plant.

STUTTGART, ARK.—The Stuttgart Public Service Company has been incorporated with a capital of $150,000 and authorized to build and operate electric light and power plants, heating plants and ice plants. F. G. Proutt is president and the other directors are T. H. Rhodes, W. A. Smith, L. P. Miles and S. P. Walker.

CANADIAN, OKLA.—Plans are being considered here for the installation of an electric-lighting plant.

HENRYETTA, OKLA.—The Henryetta Electric Light Company is considering the installation of an electric-lighting system in the town of Dewar.

CRESCENT, OKLA—A franchise to install an electric-lighting plant here has been asked by Mr. Askins.

DALLAS, TEX.—The Texas Power & Light Company, which recently filed an amendment to its charter increasing its capital stock from $13,000,000 to $14,000,000, plans to make important extensions of its transmission system. It will also build an additional generating station, which will be located at Austin. Fred Slater, of New York, has been elected vice-president and general manager of the company, and W. B. Head, of Dallas, a vice-president of the company.

SHINER, TEX.—The City Council will make extensive improvements to the electric-lighting plant, which it recently purchased, and also to the municipal waterworks system.

DALLAS, TEX.—The Texas Electric Railway Company has been incorporated with a capital stock of $10,500,000 for the purpose of taking over the holdings of the Texas Traction Company, now operating an interurban electric railway from Dallas to Denison, and of the Southern Traction Company, now operating an interurban line between Dallas and Waco, and between Dallas and Corsicana. The new company is authorized in its charter to extend the merged system from Waco to San Antonio, via Austin, a distance of about 185 miles; from Waco to Houston, a distance of about 200 miles, and from McKinney to Paris, a distance of about 125 miles. The company will also take over the street railway systems of Denison, Sherman, McKinney, Waxahachie, Corsicana and Waco. The incorporators are J. F. Strickland, M. R. Templeton and Osce Goodwin, all of Dallas. The Texas Electric Company is a subsidiary of the General Electric Company.

GLADEWATER, TEX.—The power plant of the Gladewater Light Company recently was destroyed by fire.

LOCKHART, TEX.—The Citizens' Light & Water Company has been incorporated to operate the local electric-lighting and water plants. It has a capital stock of $75,000. E. B. Coopwood is interested.

TERRELL, TEX.—It is reported that the Texas Midland Railroad, which runs between Paris and Ennis, 124 miles, is to be converted into electric transit. Col. E. H. R. Green, of New York, is president and general manager.

WACO, TEX.—The City Commission has contracted with the Texas Power & Light Company for the installation of ornamental street lights in Austin Street for a distance of six blocks.

DATES AHEAD.

International Association of Municipal Electricians. Annual convention, Baltimore, Md., August 22-25. Secretary, C. R. George, Houston, Tex.

Association of Edison Illuminating Companies. Annual convention, Hot Springs, Va., September 4-7. Secretary, George C. Holberton, San Francisco, Cal.

Pennsylvania Electric Association. Annual convention, Eagles Mere, Pa., September 5-8. Secretary, H. N. Muller, Duquesne Light Company, Pittsburgh, Pa.

American Institute of Electrical Engineers. Pacific Coast convention, Seattle, Wash., September 5-8. Secretary, F. L. Hutchinson, 29 West Thirty-ninth Street, New York City.

Illuminating Engineering Society. Annual convention, Philadelphia, Pa., September 18-21. Assistant secretary, C. D. Fawcett, 29 West Thirty-ninth St., New York City.

Association of Iron and Steel Electrical Engineers. Annual convention, Chicago, Ill., September 18-22. Secretary, W. O. Oschmann, Oliver Steel & Foundry Company, Pittsburgh, Pa.

American Electrochemical Society. Semi-annual meeting, New York City, September 28-30. Secretary, J. W. Richards, South Bethlehem, Pa.

New England Section, N. E. L. A. Annual convention, Pittsfield, Mass., October 17-20. Secretary, O. A. Bursiel, 149 Tremont Street, Boston, Mass.

Telephone Pioneers of America. Annual meeting, Atlanta, Ga., October 19-20. Secretary, R. H. Starrett, 15 Dey Street, New York City.

WESTERN STATES.

TERRY, MONT.—Sole interest in the Terry Light & Power Company has been transferred to L. H. Gaffney, one of the original owners of the plant, which was built by Charles Boulter and L. H. Gaffney. Mr. Boulter intends to retire from the field. As the plant is considered inadequate for needs of the town, it is understood Mr. Gaffney plans necessary extensions.

WHITETAIL, MONT.—A small electric-lighting plant is to be installed in this town this summer by C. E. Warwick, of Anaconda.

TOMBSTONE, ARIZ.—Wright & Irwin, of the Home Ice Company, have been granted an electric-lighting franchise in this city.

CALDWELL, IDAHO.—Plans are being made for the entire reconstruction of the city electric-lighting system.

MONTPELIER, IDAHO.—The Swan Creek Light & Power Company is planning to extend its line into Randolph this summer, providing the town is willing to stand the expense, which will amount to about $5,000.

ARLINGTON, WASH.—Warner Marshall, of Boston, Mass., who recently secured a franchise to furnish light and power to Stanwood and Arlington and who intends to serve the towns of Silvana, Norman, and Florence, recently took over the power plants in both Arlington and Stanwood. Mr. Marshall has negotiated a contract with Stanwood for furnishing light for streets of that town. According to reports, a considerable sum of money will be expended in reconstructing both the Stanwood and Arlington plants, and an additional sum will be expended in constructing extensions to outlying districts to serve small ranchers.

CHENEY, WASH.—Residents of Cheney are circulating a petition asking the Spokane Heat, Light & Power Company to make an extension of its transmission lines to this city.

DEMING, WASH.—The Bellingham division of the Puget Sound Traction, Light & Power Company announces plans for the installation of a 150-horsepower substation in Deming, to supply that town with energy for business, street and residence lighting. According to R. U. Muffley, superintendent of service, Bellingham, the station will ultimately be increased to 450 horsepower, and energy will be sold to adjacent ranchers and mills.

EVERETT, WASH.—Robert Howes, engineer of Seattle, retained by the city of Everett to submit data on the development of a power site in the Sultan Basin, will complete his report this week. The city proposes the development of this site, and the government has given the city a limited time to prepare outlines of its plans. The proposition will be submitted to the voters later. The Washington Power Company had prior rights to the site which have lapsed.

SPOKANE, WASH.—Assistant City Engineer A. D. Butler has filed plans and estimates with the City Commission for the proposed ornamental curb lighting system on Main Avenue, covering the cost of installation and electrical energy for 10 years.

ASTORIA, ORE.—Plans have been practically completed by the Pacific Power & Light Company, of Portland, for the extension of its transmission lines from the Astoria plant to Seaside. Recently the company acquired the plant of the Seaside Electric Company, and it is understood it will be closed down and energy supplied from the Astoria plant of the company.

LA PINE, ORE.—The Pringle Falls Electric Company, of La Pine, recently completed the installation of a flume near here, and will shortly begin installation of electrical machinery in a power house which is under construction and which will be in operation by September 1.

MYRTLE CREEK, ORE.—M. D. Germond, of Roseburg, Ore., who was recently retained by this city to prepare plans for a municipal hydroelectric plant, has practically completed same, and an election to vote bonds for the construction of the proposed plant probably will be held at an early date.

OREGON CITY, ORE.—Plans for the construction of a municipal lighting plant here have been halted until ownership of the site of the plant has been definitely decided.

SUMPTER, ORE.—An electric substation at the Ben Harrison mine near here was

recently damaged to the extent of $9,000 by an electric storm.

THE DALLES, ORE.—The construction of a municipal lighting plant here is being advocated by city officials. A portion of the residence section of the city is in need of lighting facilities. It is reported that the matter of constructing a municipal plant will be placed before the voters at an early date.

CHICO, CAL.—The Pacific Gas & Electric Company is making an expenditure of $3,000 for improvements to substations in the immediate vicinity of Chico. The sum of $1,500 has been spent in raising the machinery above flood water at substation No. 2 at Esquon, operated jointly by the Pacific Gas & Electric Company and the Northern Electric.

FORT BIDWELL, CAL.—The Bidwell Electric Company has applied to the State Railroad Commission for a certificate of public convenience and necessity to supply electrical energy for light, heat and power in the towns of Fort Bidwell and Lake City.

FRESNO, CAL.—The Board of Supervisors will receive bids up to August 8 for the installation of an electrolier lighting system in Court House Park.

GRASS VALLEY, CAL.—The El Dorado mine in the Alleghany district is to be actively developed by Lawrence N. Wagner. The entire plant is to be electrified.

LOS ANGELES, CAL.—The City Council has ordered the installation of an electric-lighting system in Adams Street between Figeroa and Hoover Streets, and on certain other streets.

OROVILLE, CAL.—The installation of a power plant upon the ditch system of the South Feather Land & Water Company is being planned by a group of San Franciscans who own the Solano Wonder, known as the B. A. C. mine.

WHITTIER, CAL.—Following an application for a franchise, the City Council has advertised for bids for a franchise for a 50-year electric railway franchise along Philadelphia and other streets of this city.

YOSEMITE, CAL.—A bill has passed the House of Representatives appropriating $150,000 for the construction of a hydro-electric power plant in Yosemite Valley.

Proposals

LIGHTING SYSTEM.—Sealed bids will be received until July 26 for an electric-lighting system for the Trempealeau County Insane Asylum. F. W. Smith, secretary.

ELECTRICAL EQUIPMENT.—Sealed bids will be received July 25 by Easton Floe, City Clerk, Blue Earth, Minn., for transformers, lightning arresters, etc. Bids will be received at same time for the exchange of approximately 485 direct-current meters for the same number of alternating-current meters.

LIGHT AND POWER WIRING.—Sealed proposals will be received until August 1 by the Board of Administration in the Capitol Building, Springfield, Ill., for the following improvements at the Alton State Hospital, Upper Alton, Ill.: Light and power service wiring and outside lighting, according to plans and specifications on file and obtainable by written application to J. B. Dibelka, State Architect, 130 North Fifth Avenue, Chicago. Frank D. Whipp, supervisor, Board of Administration.

TELEPHONE AND TELEGRAPH AND STREET-LIGHTING SYSTEMS.—Bids for two improvements as follows will be received by W. H. Harrison, City Clerk, Great Falls, Mont., until 8 p. m., July 25: For the construction complete of a police telegraph and telephone system, and for the installation complete of an ornamental street-lighting system in special improvement district No. 275. Plans and specifications may be obtained from City Engineer L. B. Evanson. Bids on either job must be accompanied by check for 10 per cent payable to the City of Great Falls.

ELECTRICAL SUPPLIES.—Bids will be received at the Bureau of Supplies and Accounts, United States Navy Department, Washington, D. C., for furnishing supplies at the following naval stations: Schedule 9886, Puget Sound, Wash., miscellaneous telephones. Schedule 9887, Newport, R. I., 20,000 feet of single-conductor wire. Schedule 9891, Brooklyn, N. Y., 100 storage-battery testing outfits. Schedule 9895, Brooklyn, N. Y., four torsion meters. Schedule 9897, Norfolk, Va., two motors. Bidders desiring to submit proposals should make application immediately for schedules to the Bureau, or to the Purchasing Office nearest to navy yard where delivery is to be made.

New Incorporations

PADUCAH, KY.—Equi-Light Company. Capital, $10,000. Incorporators: Harry Wallace, N. P. Wallace and others.

BOISE, IDAHO.—Shelley Light & Power Company. Capital, $100,000. Incorporators: J. F. Shelley, T. W. Shelley and Thomas Mitchell.

CINCINNATI, O.—Battery Equipment Company. Capital, $10,000. Incorporators: F. O. Andreidge, H. M. Harvin, G. P. Walker and others.

NEW YORK, N. Y.—C. W. Kalb Electric Company, Capital, $10,000. Incorporators: C. W. Kalb, W. S. Davis and J. F. Sandhoff, all of 150 Nassau Street.

INDIANAPOLIS, IND.—R. H. Maple Company. Capital, $50,000. Electrical goods. Incorporators: V. H. Lockwood, R. G. Lockwood and R. H. Maple.

SOUTH BEND, IND.—Quick Action Ignition Company. Capital, $450,000. Manufacture electrical machinery. Incorporators: O. R. Beyler, G. R. Dunkle and E. E. Hawkinson.

BUFFALO, N. Y.—Clemens Electrical Corporation. Capital, $5,000. Manufacture electric fuses, buzzers, transformers and soldering irons. Incorporators: J. G. Clemens and L. E. Levee, of Buffalo, and L. G. Smith, of Farnham, N. Y.

Financial Notes

Columbia Gas & Electric Company June gross increased $55,560. For six months the gross increased $387,312 and the net $238,509.

The Public Service Electric Company, of Newark, N. J., has received permission from the Public Utility Commission to issue $3,000,000 of capital stock.

Laurentide Power Company is preparing to make announcement of the sale of $3,500,000 5-per-cent first mortgage bonds maturing in 1946 to New York and Montreal bankers. The bonds will be sold to the public at 90. Laurentide Power has probably the smallest funded debt in proportion to generating capacity of any hydroelectric proposition in the United States or Canada, it now being but about $60 per horsepower of generating capacity.

New Orleans Railway & Light Company has sold to Bertron, Griscom & Company and Reilly, Brock & Company, of New York City, $3,250,000 refunding and general-lien five-per-cent gold bonds, due 1949, and $3,250,000 two-year six-per-cent debenture gold notes. The proceeds of the sale will be used to retire $4,000,000 six-per-cent debenture gold notes which matured June 1, and to provide funds for other capital requirements. The bonds are being offered at 92.

Official announcement of the Philadelphia Electric financing plan, it is understood, will be made shortly by the company. The loan to be issued at this time will be $35,000,000, according to current information, with authorization under the mortgage for a total of at least $50,000,000. It will be a first mortgage five-per-cent bond to take up present outstanding issues. The issue will be underwritten and a portion not required for the exchange of the old bonds will provide new cash capital requirements needed by the growth of the business.

The California Railroad Commission has issued an order granting the San Joaquin Light & Power Corporation, of Fresno, permission to issue $666,500 of first and refunding mortgage series-C, six-per-cent gold bonds at not less than 96 per cent of their face value and accrued interest. The company is to use the proceeds from these bonds in reimbursing its treasury for additions and betterments already made, amounting to $48,800, and for $617,700 of new construction, additions and betterments, including the purchase of transformers from consumers as provided in the Commission's recent decision relative to the company's rates. For the purchase of the transformers in question the company will expend approximately $232,000.

Wisconsin Light, Heat & Power Company has been organized in Wisconsin by interests identified with the North American Company and probably will be a new subsidiary of that corporation. There will be about 20 electric light and power plants consolidated under the new company, the management of which will be in charge of John I. Beggs of the North American Company. The Wisconsin Railroad Commission has authorized the company to issue $2,497,000 in bonds and $1,000,000 in stock. Of the stock and bonds of the new company $750,000 of bonds and $363,500 stock will be used to acquire the properties and pay the floating and bonded indebtedness of the Southern Electric Light & Power Company, the Beaver Dam Light & Power Company, the transmission system from Minnesota Junction to Burnett, and the distributing systems at Horicon and Minnesota Junction. Bonds to the amount of $779,000 and $378,000 stock will be used in the construction of a steam generating plant of 15,000-kilowatt capacity at Portage, and $536,000 bonds and $250,000 stock will be used for the construction of transmission lines to and the erection of new distributing plants at Portage, Arlington, Morrisonville, Windsor, Kirkwood, North Freedom, Reedsburg, Cambria, Markesan, Ripon, Wyocena, Rio, Omro and Randolph. The generation of power for the properties will be centralized in the new station at Portage and all the towns will be linked with the new plant by an extensive transmission and distribution system.

Dividends.

	Term	Rate	Payable
Bangor Ry. & Elec.	Q	0.5 %	Aug. 1
Col. Ry., Pw. & Lt., Series B., pf.	Q	1.25%	Aug. 1
Col. Ry., Pw. & Lt., com.	Q	1.25%	Aug. 1
Crocker-Wheeler, com.	Q	1.5 %	July 15
Crocker-Wheeler, pf.	Q	1.75%	July 15
Elec. Bond & Sh., pf.	Q	1.5 %	Aug. 1
Elec. Bond & Sh., com.	Q	2 %	July 15
Jacksonville Trac., pf.	Q	0.75%	Aug. 1
Keystone Tel., pf.	—	2 %	Aug. 1
Milw. El. Ry. & Lt., pf.	Q	1.5 %	July 31
Montreal Tramways	Q	2.5 %	Aug. 1
New Hamp. El. Rys., pf.	—	2 %	July 31
Sierra Pacific El., pf.	Q	1 %	Aug. 1

Reports of Earnings.

PORTLAND RAILWAY, LIGHT & POWER

	1916	1915
May gross	$ 445,223	$ 446,149
Net after taxes	188,529	192,421
Surplus after charges	6,604	3,981
Twelve months' gross	5,457,872	5,794,271
Net after taxes	2,388,931	2,644,825
Surplus after charges	192,314	437,538

AMERICAN TELEPHONE & TELEGRAPH.

The American Telephone & Telegraph report of earnings for the six months ended June 30, 1916, compares as follows:

	1916	1915
Dividends	$13,253,106	$12,617,898
Interest, etc.	6,874,308	6,714,330
Telephone traffic	*4,197,037	3,206,018
Other income	869,577	621,559
Total income	25,284,030	23,249,807
Net	22,458,874	20,442,628
Interest	3,287,791	3,490,949
Balance	19,171,083	16,951,679
Dividends	15,425,007	14,250,361
Surplus	3,746,045	2,701,287

*One month estimated.

Earnings of the American Telephone & Telegraph Company and associated holding and operating companies in the United

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	July 17.	July 10.
American Tel. & Tel. (New York)	129⅛	129¼
Commonwealth Edison (Chicago)	145	145
Edison Electric Illuminating (Boston)	236½	239
Electric Storage Battery common (Philadelphia)	62½	62½
Electric Storage Battery preferred (Philadelphia)	62½	62½
General Electric (New York)	164	167
Kings County Electric (New York)	130	130
Massachusetts Electric common (Boston)	5½	6
Massachusetts Electric preferred (Boston)	32⅛	32
National Carbon common (Chicago)	168	168
National Carbon preferred (Chicago)	121	121
New England Telephone (Boston)	133½	134
Philadelphia Electric (Philadelphia)	28⅞	29
Postal Telegraph and Cables common (New York)	82½	82½
Postal Telegraph and Cables preferred (New York)	67½	67⅝
Western Union (New York)	93	94¼
Westinghouse common (New York)	54½	56¼
Westinghouse preferred (New York)	65	70

States, not including connected independent or sub-license companies, for May and five months compare as follows:

	1916	1915
May gross	$21,746,353	$19,366,759
Net after taxes	6,562,236	5,756,597
Surplus after charges	4,764,681	3,915,959
Surplus after dividends	1,836,660	1,182,285
Five months' gross	105,500,128	94,763,470
Net after taxes	32,751,510	28,425,323
Surplus after charges	23,533,529	18,959,247
Surplus after dividends	9,085,145	5,631,406

WESTERN UNION TELEGRAPH.

The Western Union Telegraph Company report of earnings for the six months ended June 30, 1916 and 1915, compares as follows, (June, 1916, estimated):

	1916	1915
Total revenue	$29,126,269	$24,215,707
Depreciation, repairs, etc.	3,882,528	3,884,130
Other operating expenses including rent of leased lines and taxes	18,396,064	15,550,540
Total expenses	22,278,592	19,434,670
Balance	6,846,677	4,781,037
Bond interest	665,925	668,600
Surplus	*6,180,752	4,112,437

*Surplus equal to an annual rate of about 12 per cent on the $99,786,727 capital stock outstanding, as compared with 10.19 per cent earned in the fiscal year ended December 31, 1915.

COLUMBUS RAILWAY, POWER & LIGHT COMPANY.

	1916	1915
May gross	$ 277,688	$ 245,947
Net after taxes	112,951	94,777
Surplus after charges	70,076	56,956
Twelve months' gross	3,270,766	3,065,554
Net after taxes	1,346,952	1,219,210
Surplus after charges	848,752	751,235
Balance after preferred dividends	563,303	466,112

Electrical Patents Issued July 4, 1916

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,189,224, 1,189,255 and 1,189,226. Railway Safe-Running Device. A. R. Angus, Spit Road Mosman, New South Wales, Australia. First and second patents: systems giving indications on trains of safe conditions. Third patent: track contactor for above.

1,189,228. Electrical Protective Device. A. H. Bakken, assignor to Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa. Oil circuit-breaker.

1,189,231. Reflector Shade. R. B. Benjamin, assignor to Benjamin Electric Mfg. Co., Chicago, Ill. For incandescent lamps.

1,189,234. Electric Measuring Instrument. H. W. Brown, assignor to Westinghouse Electric & Mfg. Co. Recording meter.

1,189,235. Bond. J. R. Brown, assignor to The Ohio Brass Co., Mansfield, O. Manner of securing strands to terminal in rail bond.

1,189,236. Duplex Telegraph System. W. M. Bruce, assignor to The United Telegraph & Cable Co., Springfield, O. Alternating-current system.

1,189,240. Electrical Relay. A. W. Copley, assignor to Westinghouse Electric & Mfg. Co. Wattmeter type; for circuit-breakers.

1,189,260. Engine Starter. A. L. Kennedy, assignor to Holtzer-Cabot Electric Co., Brookline, Mass. System including dynamoelectric machine and storage battery.

1,189,265. Electrode. I. Ladoff, assignor to Westinghouse Electric & Mfg. Co. Gives white arc-light.

1,189,272. Lightning Arrester. W. McK. McClintock, St. Paul, Minn. Has block preventing passage of normal current, but offers decreased resistance to high-voltage current.

1,189,273. Oscillating Fan. W. M. McEwen, Chicago, Ill. Oscillating mechanism.

1,189,274. Circuit-Interrupter. H. G. MacDonald, assignor to Westinghouse Electric & Mfg. Co. Oil circuit-breaker.

1,189,276. Circuit-Interrupter. J. N. Mahoney and W. M. Austin, assignors to Westinghouse Electric & Mfg. Co. Mounting of carbon in vertical, edgewise circuit-breaker.

1,189,290. Control System. C. Renshaw, assignor to Westinghouse Electric & Mfg. Co. Series-parallel control of motors.

1,189,292. Control System. L. G. Riley, assignor to Westinghouse Electric & Mfg. Co. Modification of above.

1,189,296. Variable-Speed Motor. H. M. Schiebe, assignor to Westinghouse Electric & Mfg. Co. Induction motor winding.

1,189,314. Relay. C. R. Underhill, assignor to Underhill Telegraph Insulator Co., Jersey City, N. J. Switch closed by relay has slow return movement so it remains closed after relay circuit opened.

1,189,316. Circuit-Controlling Instrument. E. W. Vogel, assignor to Chicago Railway Signal & Supply Co., Carpentersville, Ill. Operated by spreading or deflection of track rails.

1,189,317. Inductive Telephone Installation. H. VonKramer, Birmingham, England. For communicating between trains on parallel tracks.

1,189,326. Impulse Starter. P. A. Wiley, assignor to Kokomo Electric Co., Kokomo, Ind. For electric generator.

1,189,341. Electric Locomotive. A. F. Batchelder, assignor to General Electric Co., Schenectady, N. Y. Location of controller and resistance.

1,189,350. Adjustable Lamp-Support. F. A. Culver, Detroit, Mich. For headlights.

1,189,356. Electric Furnace. P. Eyermann, Witkowisz, Austria-Hungary. Arrangement of crucible and electrodes with former rotatable and tiltable.

1,189,364. Automatic Telephone Switch. A. E. Keith, assignor to Automatic Electric Co., Chicago, Ill. Operation controlled by grounding certain of its contacts.

1,189,374. Ignition Dynamo. C. T. Mason, assignor to Splitdorf Electrical Co., Newark, N. J. Special structure including distributer.

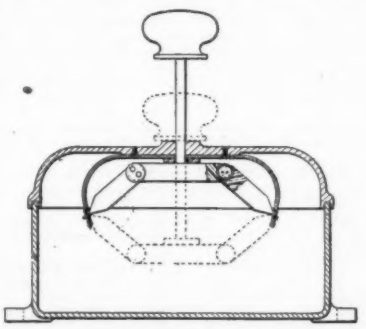
1,189,392. Circuit-Interrupter. C. Allborg and T. P. Pukerud, assignors to Westinghouse Electric & Mfg. Co. Carbon-break circuit-breaker of vertical edgewise type.

1,189,400. Electric Regulator for Incubators. W. W. Smith, Hawthorne, Cal. Dampers electromagnetically controlled by thermostat.

1,189,409. Automatic Motor Protecting Switch. J. A. VanAlstyne, assignor of one-half to C. V. Schneider, Sacramento, Cal. For three-phase circuit.

1,189,411. Telephone Transmission System Wherein Reinforcing Repeaters are Employed. A. S. J. van Kesteren, Vlisingen, Netherlands. Repeaters in parallel lines connected at their ends and to each subscriber's station, the damping in a closed circuit formed by the parallel lines being greater than the repeater reinforcement.

1,189,413. Adjustable Electric Lamp Support. A. E. Wells, Toronto, Canada.



No. 1,189,530.—Electric Switch.

Lamp on trolley running on laterally extending, inclined arm.

1,189,419. Controlling Means for Electric Signs. W. Bach, assignor to R. C. Maxwell Co., Trenton, N. J. Lamps of bank controlled by metallic characters on endless carrier.

1,189,435. Electrical Connection. W. S. Edmands, Boston, Mass. Plug and socket connector for cable with device for taking strain off connector.

1,189,455. Signal Device. J. E. Keppel, St. Louis, Mo. Details of obstacle-operated circuit-closer on car.

1,189,458. Telephone-Exchange System. A. E. Lundell, assignor to Western Electric Co., New York, N. Y. Automatic system comprising slow-acting relay at connector to control steering switch.

1,189,459. Electrical Pole and Pole Base. E. O. Lundin, Cambridge, Mass. Structural details of light pole.

1,189,490. Telephone Attachment. A. Sanders, assignor of one-third to I. Scherer, New York, N. Y. Permits sounds to be received without removing receiver from hook.

1,189,520. Lighting Fixture. H. C. Adams, St. Louis, Mo. Support for top reflector and underneath bowl.

1,189,525. Telephone System. G. Babcock, assignor to Telechronometer Co. Rochester, N. Y. Metering arrangements where rate depends on number and lengths of conversations.

1,189,530. Electric Switch. H. H. Berry, London, and W. J. Markham, Birmingham, England. Toggle structure for mounting cartridge fuses. (See cut.)

1,189,533. Portable Electric-Lamp Stand. A. Bouchery, assignor to Waterbury-Wallace Co., New York, N. Y. For single incandescent lamp.

1,189,546. Telegraphic Sending Machine. P. Dinger, Cleveland, O., assignor of one-half to A. L. Lawrence, Cleveland, O. Has vibratory dot-sender.

1,189,565. Lightning Conductor. D. W. Hartsaw, Bristow, Okla. Has rotatable tube carrying conductors having attractive points and a wind cane for rotating the tube to maintain conductors on leeward side.

1,189,581. Method of and Apparatus for Electric Welding of Metallic Plates. C. H. Kicklighter, Atlanta, Ga. Employs two opposite currents from single-phase source, inductively interlinked.

1,189,582. Method of Electric Welding. C. H. Kicklighter. Employs polyphase currents arranged to prevent induction in work.

1,189,583. Method of Electric Riveting. C. H. Kicklighter. Two equal heating currents conducted through rivets in opposite directions.

1,189,584. Apparatus for and Method of Electric Fastening of Metals. C. H. Kicklighter. Three-phase currents separately passed through work and then united.

1,189,592. Illuminating Device. H. J. Lutz, Wheeling, W. Va. For inside of phonograph cover; battery lamp controlled by gravity device according to position of cover.

1,189,596. Telephone and Telegraph Pole. W. McFadden, Davis, W. Va. Has tripod-like arrangement of uprights.

1,189,621. Non-Glaring Headlight. C. E. Post and P. G. Wagner, Los Angeles, Cal. Reflector has upper half smooth and lower half comprises series of concave deflector plates.

1,189,651. Time-Controlled Mechanism for Operating Lights. W. H. Adsit, assignor to J. G. Thomas, Batavia, N. Y. Clock movement governs light control.

1,189,657. Attendants' Signaling System. F. Brinkman, Hanover, Germany, and F. G. Bell, London, England. Arrangement of groups of stations having signaling devices for different classes of attendants.

1,189,664. Neon Tube. G. Claude, Boulogne-sur-Seine, France. Process of forming luminous neon tubes partially purified by vacuum and by an electric current and previously charged with required amount of neon.

1,189,685. Switch. M. Guett, assignor to Hart & Hegeman Mfg. Co., Hartford, Conn. Special structure of two-push-button, snap switch.

1,189,703. Alternating-Current Motor. B. G. Lamme, assignor to Westinghouse Electric & Mfg. Co. Three-phase commutator motor.

1,189,725. Method of and Apparatus for Producing High Temperatures. E. F. Northrup, Princeton Borough, N. J. Integral tubular graphite resistor.

1,189,728. Telephone Repeater. A. H. Olsson and H. B. N. Pleijel, Stockholm, Sweden. For both speech and calling currents.

1,189,738. Device for the Rectification of Alternating Electric Currents. O. W. Richardson, Princeton, N. J. Non-volatile resistance in exhausted metallic casing.

1,189,745. Train-Control Apparatus. H. G. Sedgwick, assignor to National Safety Appliance Co., Mill Valley, Cal. Circuit details of train-control device in car circuit controlled by road-bed devices.

1,189,755. Portable Electric Light. H. R. Van Deventer, Sumter, S. C. Self-contained lighting unit comprising manual magneto.

1,189,758. Picture-Projecting Apparatus. R. H. Waller, Nashville, Tenn. Light cut off during movement of slide carrier.

1,189,760. Electrically Operated Sash-Holder. W. Weiskopp, St. Paul, Minn. Sash-prop electromagnetically removed.

1,189,768. System of Electrical Distribution. J. L. Woodbridge, Philadelphia, Pa. Interconnection of alternating and direct-current circuits.

1,189,771. Electrical Control Apparatus. C. Armbruster, Roslyn, Pa. Has resistance-controlled lamp for indicating position of direction-controlling motor switches in response to operation of switch actuating magnets.

1,189,784. Trolley-Wire Hanger. G. H. Bolus, assignor to Ohio Brass Co., Mansfield, O. For attachment to span wire.

1,189,785. Method of and Apparatus for Determining Transformation Points. R. P. Brown, assignor to Brown Instrument Co., Philadelphia, Pa. For determining transformation temperature of test body.

1,189,791. Apparatus for and Method of Exciting Electric Oscillations. E. L. Chaffe, assignor to Fulton Cutting, Tuxedo Park, N. Y. Structure and arrangement of exciter and radiating circuits.

1,189,794. Electric Regulation. J. L. Creveling, assignor to Safety Car Heating & Lighting Co., New York, N. Y. Axle, car-lighting system.

1,189,795. Mechanical Horn. G. C. Dean, assignor to Lovell-McConnel Mfg. Co., Newark, N. J. Has motor-operated diaphragm.

1,189,796. Signaling Device. W. W. Dean, assignor to Garford Mfg. Co., Elyria, O. Electric horn.

1,189,830. Metallurgy. H. W. Kimball, assignor to American Zinc, Lead & Smelting Co., Boston, Mass. Zinc liquid condensed from gas in field of electric stress thereby preventing formation of blue powder.

1,189,836. Telephone System. E. Land, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Semi-automatic.

1,189,848. Meter Panelboard. J. P. McGrady, assignor to Worcester Electric & Mfg. Co., Worcester, Mass. Details of switches and connections.

1,189,855. Meter-Testing Device. T. E. Murray, Jr., assignor to T. E. Murray, New York, N. Y. For three-wire system.

1,189,856. Method of Localizing the Bur at Electric Butt or Edge Welded Joints. T. E. Murray, New York, N. Y. Details of manipulation.

1,189,862. Ringing-Current Interrupter. H. F. Obergfell, assignor to Automatic Electric Co., Chicago, Ill. For successively interrupting ringing current of different groups of subscribers' lines.

1,189,869. Liquid-Gauge. F. I. Remy, B. P. Remy and A. Berger, assignors to Remy Brothers Co., Anderson, Ind. Resistance changed by height of liquid changes balance of indicator circuits.

1,189,870. Circuit-Making and Breaking Device. L. T. Rhoades, assignor to New York Coil Co., New York, N. Y. Details of cam-operated ignition interrupter.

1,189,881. Wireless Telegraphy. F. G. Simpson, Seattle, Wash. Arrangement and structure of aerial and receiving circuit.

1,189,883. Apparatus for Limiting the Traction of an Electromagnet. I. M. Stein, assignor to T. E. Murray, New York, N. Y. Apparatus of the wattmeter type.

1,189,887. Method for Controlling the Efficiency of Mercury Rectifiers. W. Tschudy, Lynn, Mass. Wave form radiated is controlled by varying vapor density or pressure.

1,189,891. Electrical Relay. H. G. Webster, assignor to J. R. Garfield, Cleveland, O. Details of multiple-contact device.

1,189,895. Overhead Trolley System. S. Wilson, Chicago, Ill. Special wire-crossing and trolley structure for co-operating with it.

1,189,900. Switch. V. G. Apple, assignor to Apple Electric Co., Dayton, O. Details of rotary switch.

1,189,931. Resistance Box and the Like. A. Frohne, Chicago, Ill. Contacts formed by cutting metal bar surrounded by insulation into sections.

1,189,947. Controller for Electric Motors. C. T. Henderson, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Field windings supplied from batteries have their relative connections and resistance changed.

1,189,956. Combination Switch-Lock. J. H. Jefferies, Inglewood, Cal. Rotary switch spindle for connecting with magneto or battery controlled by tumblers.

1,189,960. Insulating Bushing. J. B. Johnson, Laurel, S. D. For passage through wall; tubular with hood at one end for outside of wall.

1,189,973. Electrical Cutout. E. Kraus, assignor to General Electric Co., Schenectady, N. Y. Comprises conductors separated by helical conductor with boron coating. (See cut.)

1,189,996. Incandescent Electric Lamp. A. A. Orange, assignor to General Electric Co. Gas-filled, tungsten lamp.

1,189,997. Motor. M. Osnos, assignor to General Electric Co. Compensated series motor operated by pulsating current.

1,190,009. Induction Motor. H. G. Reist and H. Maxwell, assignors to General Electric Co. Squirrel cage cast in core.

1,190,015. Train-Stopping Mechanism. A. P. Sanborn and R. C. Wilson, Ossining, N. Y. Automatic block-signaling system.

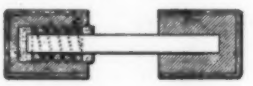
1,190,018. Electrical Starting Device. J. L. Schureman and C. J. Anderson, assignors to Cutler Hammer Mfg. Co., Milwaukee, Wis. Switching mechanism for motor starting.

1,190,025. Battery Separator. J. M. Skinner, assignor to Philadelphia Storage Battery Co., Philadelphia, Pa. Wooden plate with natural laminations transverse.

1,190,032. Automatic Electric Switch. S. S. Stahl, Connellsville, Pa. Special structure closing knife blade by hammer blow and opening with quick break.

1,190,041. Electric Switch Indicator. G. B. Thomas, assignor to Bryant Electric Co., Bridgeport, Conn. Indicates open or closed position of lamp socket switch.

1,190,048. Dynamoelectric Machine. H. Treitel and K. Sulzberger, assignors to



No. 1,189,973.—Electrical Cutout.

General Electric Co. Has provision for controlling circulation of cooling fluid through machine.

1,190,054. Induction Motor. J. B. Wiard, assignor to General Electric Co. Structural details of secondary member.

1,190,060. Electric Switch. G. Wolgg, assignor to General Electric Co. Switch held closed by collapsible connection which is restored on moving actuating member to open position.

1,190,061. Thermostat. J. J. Wood, assignor to General Electric Co. Details of thermostat switch.

1,190,066. Electromagnetic Relay. A. P. Young and A. H. S. Watson, assignors to General Electric Co. Structural details.

1,190,071. Apparatus for Projecting Radiant Energy. W. P. Adams, Syracuse, N. Y. Incandescent lamp at focus of reflector enveloped in material transmitting visible and certain invisible radiations.

1,190,086. Telephone Circuit. A. E. Beachum, assignor of one-half to R. L. Steele, Rockingham, N. C. Has two primaries on repeater coil, one in series with balancing resistance connected across other.

1,190,090. Electric Flash Lamp. C. A. Bennett, Galt, Cal. For attachment to dry cell.

1,190,095. Production of Pictures in Natural Colors by Photomechanical Means. B. Boubnoff, Petrograd, Russia. Copies of pictures in relief on cylinder are sprayed with air regulated by electromagnetically controlled valve.

1,190,103. Switch. J. R. Byrne, assignor to General Electric Co. Rotary snap-switch mechanism.

1,190,104. X-Ray Tube. C. E. Campbell, Lynn, Mass. Structural details.

1,190,112. Arrester for Sound-Producing Apparatus. C. Y. Clawson, Salt Lake City, Utah. Brake-control circuit for phonograph controlled by sound arm.

1,190,120. Electric Winding. E. E. F. Creighton, assignor to General Electric Co For transformers.

1,190,135. Means for Preventing Corona Losses. G. Faccioli, assignor to General

No. 1,190,135.—Means for Preventing Corona Losses.

Electric Co. Conductor is in form of a tubular cage. (See cut.)

1,190,140. Protective Device. J. J. Frank, assignor to General Electric Co. Structure of liquid resistance.

1,190,150. Speed Control of Direct-Current Motors. H. V. Green, assignor to General Electric Co. Vibratory contact field control regulating for constant speed.

1,190,156. Submarine Telegraphy or Telephony. W. Hagnemann, Kiel, Germany. For communicating with ships.

1,190,157. Electrical Instrument. C. I. Hall, assignor to General Electric Co. Heat-operated current-indicator.

1,190,159. Arc-Lamp. C. A. B. Halvorson, assignor to General Electric Co. Arrangement of globes and frame.

1,190,162. Method of Producing a Flaming or Luminous Arc. J. L. R. Hayden, assignor to General Electric Co. Light-giving materials proceed from one electrode and steadying vapors from other.

1,190,167. Automatic Control for Flash-Boilers. G. H. Hill, assignor to General Electric Co. Temperature of water in number of electrically heated pipe sections is equalized.

1,190,173. Automatic Train-Stopping and Recording Device. F. F. Hudson, assignor to Recording Safety Device Co., Memphis, Tenn. Air brake is magnetically controlled.

1,190,175. Ignition System. C. F. Kettering, assignor to Dayton Engineering Laboratories Co., Dayton, O. Difference in lag compensated for in combination of direct and indirect circuits.

1,190,176. Illuminated Sign or Electrograph. E. J. Kingsbury, Juneau, Alaska. Manner of operating a number of monogram units.

1,190,185. Automatic Telephone System. T. G. Martin, assignor to Automatic Electric Co., Chicago, Ill. Circuits of common-battery system.

1,190,189. Electric Switch. G. B. Pilkington, assignor to Waterbury Button Co., Waterbury, Conn. For lamp sockets; operated by pinching finger hold on end of lever through side of casing against finger hold on casing.

1,190,190. Carbon Contact Holder. C. M. Proctor, assignor to Security Trust Co., Detroit, Mich. For mounting carbon button on armature spring.

1,190,204. Means for Detecting Imperfections in Motion-Picture Films. R. St. James, Great Barrington, Mass. Imperfection or break in film closes alarm circuit.

1,190,205. Thermostat. I. E. Storey, Los Angeles, Cal. Details of contact device.

1,190,207. Bell-Sounding Mechanism. F. Williams, assignor to Acme Register Co., Somerville, Mass. Hammer for gong operated from constantly running motor.

1,190,243. Speed Governor for Electric Motors. H. J. McMahan, Monessen, Pa. Centrifugal device controls intermittent connection of resistance in circuit of commutator motor.

1,190,244. Contact-Breaker Device for Electromagnetic Vibrating Members. A. H. Maitre and V. H. G. Martin, Rouen, France. Structural details.

1,190,247. Railway Signaling System. H. A. Wagner, Short Hills, N. J. Block system wherein track rails are in power circuit and signaling current supplied by opposing sources of different characteristics from the power circuit.

PATENTS EXPIRED.

The following United States electrical patents expired on July 18, 1916:

628,932. Conductor's Magnetic Check-Holder. J. Flinner, Standish, Kan.

628,957. Electric Transformer. J. W. Packard, Warren, O.

628,967. Electrically Driven Vehicle. H. Van Hoevenbergh, New York, N. Y.

628,968. Electric Locomotion. H. Van Hoevenbergh, New York, N. Y.

628,973. Manufacture of Incandescent Lamps. A. Wierre, Paris, France.

628,982. Cigar Lighter. A. C. Gruhlke, Waterloo, Ind.

628,990. Key Socket. C. G. Perkins, Hartford, Conn.

628,994. Automatic Carrier for Electric Wires. F. T. Schottle and H. C. Willitz, Sheboygan, Wis.

629,022. Coin-Freed Medical Battery and Appendage. B. Wolinski, New Haven, Conn.

629,043. Apparatus for Electrolysis. J. T. Morrow, Great Falls, Mont.

629,058. Telephone Holder. M. Wohlgemuth, Detroit, Mich.

629,070. Apparatus for Producing Oxygen and Hydrogen. P. Garuti and R. Pompili, Naples, Italy.

629,079. Electrically Propelled Vehicle. R. M. Hunter, Philadelphia, Pa.

629,130. Electrical Measuring Instrument. E. W. Jewell, Chicago, Ill.

629,153. Electric Heater. M. W. Dewey, Syracuse, N. Y.

629,163. Telephone System. R. J. Hewett, St. Louis, Mo.

629,198. Incandescent Lamp. A. H. Miller, Central City, Colo.

629,201. Means for Preventing Sparking When Making and Breaking Electric Circuits. A. Muller, Hagen, Germany.

629,211. Electric Railway. C. Russell, S. Hill and A. C. Welchaus, Lancaster, Pa.

629,260. Electrode for Storage Batteries. C. W. Kennedy, Rutledge, Pa.

629,291. Electric Arc-Lamp. F. G. Hall, Jr., and I. E. Burdick, Danville, N. Y.

629,298. Electrical Signaling Apparatus. C. E. Kells, Jr., New Orleans, La.

629,302. Apparatus for Operating Electric Signals for Elevators. H. Pedersen, New York, N. Y.

Design 31,238. Field-Magnet Frame. W. P. Freeman, New York, N. Y.